PHYSALOPTERA PSEUDOPRÆPUTIALIS N. SP.—A STOMACH WORM OF THE CAT (NEMATODA: PHYSALOPTERINÆ)

By L. M. Yutuc

Of the College of Veterinary Medicine, University of the Philippines

ONE PLATE

The study was made upon nematodes collected at autopsy of adult cats used in the critical test of some teaniacides and in a survey on helminths. The cats came from Pandacan, Manila; University site, Quezon City; and Santa Cruz, Laguna Province. A bottle containing the stomach of a cat with the parasites turned over to me by the former Tenth Medical Laboratory of the United States Army at Mandaluyong, Rizal, was also examined. Of the 76 cats autopsied 28 were positive, or an incidence of 36.44 per cent. The greatest number recorded in a single individual was 32 parasites. In spite of this circumstance, in no instance was the ova determined in clinical materials among cats. The living worms as well as those preserved with the stomach were found attached to the epithelial lining of the stomach. Occasionally, however, a few worms were found free with stomach contents. While the fresh specimens were white to whitish-pink in tinge, those preserved in ten per cent formalin solution were white. When the worms were detached from the mucus membrane no appreciable lesions were observed. In some of the parasites the attachment to the mucosa was so firm that forceably removing them led to the breaking of the worms.

PHYSALOPTERA PSEUDOPRÆPUTIALIS n. sp.

The worms are fairly stout; body slightly attenuated anteriorly in both sexes; posterior end conical. The cuticle is very finely striated transversely and has large folds forming anteriorly into a collarette around the head (Plate 1, fig. 1). As in *P. præputialis, P. malayensis,* and *P. canis* the posterior ends of the bodies were ensheathed into the prepuce-like prolongations in both sexes (Figs. 4 and 5). In some of the specimens the prolongation covers partially the posterior end only (Fig. 4).

The mouth is surrounded by the usual two large triangular lateral lips. Each bears two teeth: a prominent single outer tooth and an inner trifid tooth. The relation in height between the inner and the outer teeth varies. It is either equal or subequal. In the illustration presented the outer appears higher than the inner tooth (Fig. 1). Each lip also bears a large subdorsal papilla and a similar subventral papilla. The inner faces of the lips are somewhat medially pointed and bears on their edges lines but not teeth (Fig. 2). The cupped circular depression between the lips and the reflected cuticle is lined with cuticular projections probably for purposes of attachment.

The male is 21 to 34 mm long and 1.0 to 1.5 mm thick. Oesophagus is 3.8 by 0.4 mm; muscular portion 0.8 by 0.1 mm and the glandular 3 by 0.4 mm; collarette 0.3 mm wide. Cervical papillæ and the excretory pores are located 1.13 mm from the anterior end; nerve ring situated on the slender portion of the œsophagus near its junction with the glandular portion.

The posterior end of some males is retracted completely into a prepuce-like sheath of the cuticle and is very much like *P. præputialis* v. Linst., 1889, *P. malayensis* Ortlepp, 1922, and *P. canis* Moenig, 1929. In others this is only partial. It does not entirely cover the posterior end. There are four stout stalked circumcloacal papillæ, supporting the alæ of the tail. The fourth pair is decidedly slender and shorter than the first three pairs. There are three precloacal sessile papillæ. The middle is much larger than the two lateral ones. Immediately behind the cloaca are the three pairs of sessile papillæ. The first two pairs are arranged almost transversely, while the third follows the first pairs. They form two triangular patterns. While the fourth pair is situated 0.8 to 1.2 mm, the fifth pair is about 0.5 to 0.6 mm from the posterior tip. The ventral aspect of the hind end is roughened with pointed beads (spines) arranged more or less longitudinally from near the anterior margin of the first stalked papilla up to about the middle of the left spicule, again about the margin of the fourth stalked papilla until about 0.3 mm from the posterior end of the worm. Between the last pair of sessile papilla the surface is smooth. Almost encircling the cloaca are ridges; these extend laterally involving the stalked papillæ. Ridges closed to the cloaca are broken every now and then (Fig. 4).

The spicules are unequal; the left being 0.85 to 1.20 mm long by 0.05 mm wide and the right 0.60 to 0.75 mm long by 0.055 mm wide (Fig. 7). The left spicule is provided with a membranous-like blade in its concave border (Fig. 8).

The female is 27 to 44 mm long and 1.5 to 2.0 mm thick. Oesophagus 4.35 to 6.4 mm long by 0.5 to 0.70 mm wide; muscular portion 0.5 to 0.8 by 0.20 to 0.25 mm; glandular 3.85 to 5.60 by 0.50 to 0.70 mm. Cervical papillæ and excretory pores 0.9 mm from the anterior end. In the fertilized female, there is a conspicuous ring of brown or black cement material located 9.8 to 19 mm from the anterior end. Under the ring, the inconspicuous vulva is situated. The latter leads to the vagina, egg chamber, 1.4 by 0.4 mm and the two uteri (Fig. 3) which run with a number of reflections in almost parallel lines to near the posterior end of the body. Each uterus measures 42 by 0.8 mm and is continued with its corresponding oviduct, 4.5 by 0.4 mm and ovary; the latter being dilated at its connection with the oviduct. The dilated portion is 0.9 by 0.4 mm, then narrows to 0.1 mm up to the end; total length being 26 mm. Anus is 0.3 mm from the posterior end.

The eggs range from 0.05 to 0.06 by 0.03 to 0.04 mm; average length and width 0.05 and 0.03 mm respectively. They are embryonated when layed; most of those found in the genital organ are also embryonated (Fig. 6).

Host.—*Felis domestica.*

Habitat.—Stomach.

Locality.—Pandacan, Manila; University site, Quezon City; Santa Cruz, Laguna Province; Mandaluyong, Rizal Propince.

Discussion.—In considering the zoological identity of the nematode above-described, at the onset, three species of *Physaloptera* bearing preputial-like sheath have to be thought of, namely: *P. præputialis* v. Linst., 1889, *P. malayensis* Ortlepp, 1922, and *P. canis*, 1929. From these closely related species, *Physaloptera pseudopræputialis* differs in the arrangement of the sessile papillæ, the ventral caudal surface of the male and the variation in the height of the inner and outer teeth. *P. pacitæ* Tubangui, 1925, is ruled out by the number and arrangement of the sessile papillæ in the male, the absence of the preputial prolongation and the ring in fertilized female. Moreover, this nematode was found encysted in the wall of the stomach, whereas in *P. pseudopræputialis*, these were attached to the mucus membrane or free with the stomach contents. It differed from *P. rara* Hall, 1918, of the dog in the appearance of the œsophagus, variation in the height of the internal and external tooth as well as the presence of the ring in female and the preputial prolongation in both sexes. From *P. felidis* Ackert, 1936, reported in American cats, it is distinguished by the character of the ventral caudal aspect of the male, the number and arrangement of the caudal papillæ and the opening of the vulva. This species does not have a well-developed posterior preputial fold and the ring in the fertilized female is wanting. The egg chamber appears different in shape and the eggs smaller.

From these considerations the writer concludes that *Physaloptera pseudopræputialis* is structurally distinct from the other species of *Physaloptera* reported.

REFERENCES

ACKERT, JAMES E. *Physaloptera felidis* n. sp., a nematode of the cat. Am. Microsc. Soc. Trans. 45 (1936) 250–254.

HALL, M. C. A *Physaloptera* from the dog, with a note on the nematode parasites of the dogs in North America. Am. Vet. Med. Assoc. Jour. 53 (1918) 733–744.

MOENIG, H. O. *Physaloptera canis* n. sp., a new nematode parasite of the dog. Firteenth Annual Report of the Director of Vet. Services, Union of South Africa, Sec. IV (1929) 329–333.

MOENIG, H. O. Veterinary Helminthology and Entomology, 2nd ed. Baltimore, William Wood and Co., 1938. xviii + 409p.

ORTLEPP, R. J. The nematode genus *Physaloptera* Rud. Zool. Soc. London, Proc. Pt. 2 (1922) 999–1107.

ORTLEPP, R. J. Some undescribed species of the nematode genus *Physaloptera* Rud., together with a key to the sufficiently known forms. Onderspoort Jour. Vet. Sci. and Ani. Ind. 9 (1937) 71–84.

SCHWARTZ, B. Additional records of parasites from the Philippines (Note). Jour. Parasit. 12 (1925) 113.

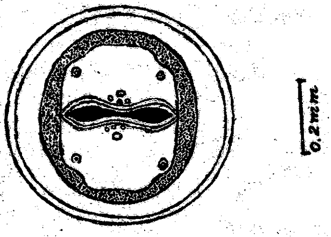
TUBANGUI, M. A. Metazoan parasites of Philippine domesticated animals. Philip. Jour. Sci. 28 (1925) 11–37.

ILLUSTRATIONS

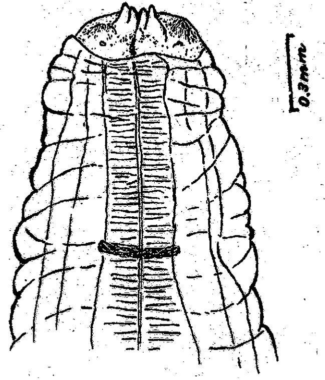
PLATE 1

FIG. 1. Dorsal view of anterior end of *physaloptera pseudopræputialis* n. sp.

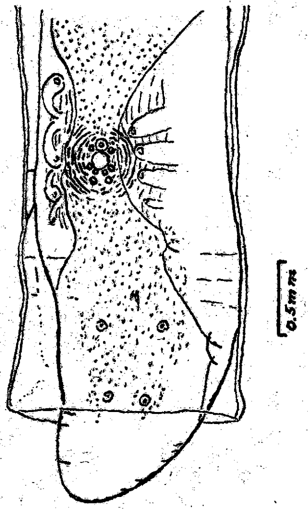
2. Oral (enface) view of *P. pseudopræputialis.*
3. Portion of the vagina, egg chamber, and portions of the two uteri, *P. pseudopræputialis.*
4. Posterior end of male, *P. pseudopræputialis.*
5. Posterior end of female, *P. pseudopræputialis.*
6. Embryonated egg, *P. pseudopræputialis.*
7. Right spicule, *P. pseudopræputialis.*
8. Left spicule, *P. pseudopræputialis.*



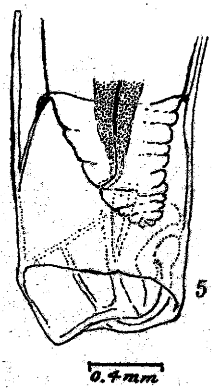
2



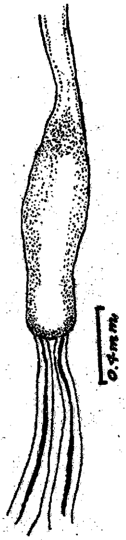
1



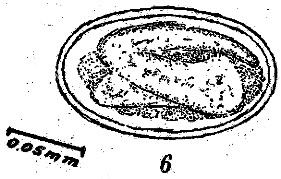
4



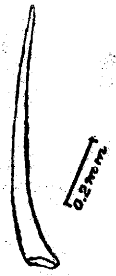
5



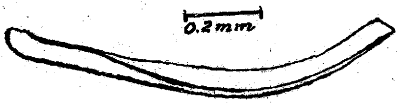
3



6



7



8

PLATE 1.

A NEW PHILIPPINE SPECIES OF NOSODENDRON

By Brigitte G. Oehme-Leonhardt
Of Manila

THREE TEXT FIGURES

In 1853, Chapuis and Candèze described the larva of *Nosodendron fasciculare* Olivier, a European species. Later on, in 1862, another French entomologist, Dufour, and his friend, Laboulbène, studied the spiracles of the larva of the same beetle. However, presumably because of poor optical accessories then available, they overlooked certain minutiæ which resulted in some erroneous conclusions. Nevertheless, these authors produced some very good drawings which they executed with astonishing skill and scientific exactness. In 1904 Ganglbauer and in 1913 Kuhnt redescribed the larva, as well as the imago, more completely.

In 1874 an American species of *Nosodendron* was described as *N. californicum* Horn. Earlier in 1824 and again in 1849, another member of this family had been named *Nosodendron unicolor* Say. All these publications dealt only with the imagines.

In 1946, Hayes and Chu described for the first time the larvæ of *Nosodendron californicum* and *Nosodendron unicolor*. In the same paper, these authors made a first, although unsatisfactory, attempt at a diagnostic key for *Nosodendron* larvæ. Their difficulty lay in the fact that they based their characters on a 1913 description and some still earlier sketches of the European *Nosodendron fasciculare;* they had not seen a single specimen of the larva. Hence, they were unable to detect that the European *Nosodendron fasciculare* Olivier and the later described American *Nosodendron californicum* Horn were one and the same species and thus the latter has to be reduced to synonym. Their larvæ show indeed identical characters. But the larva of *Nosodendron unicolor* is described for the first time in this paper.

The larvæ of the family Nosodendridæ are very interesting because of the form and position of the spiracles. The first pair of spiracles, particularly, may be situated on the mesothorax, either dorsally, ventrally, or else between the pro- and mesothoraces.

In 1948, I published a monograph of the European *Nosodendron fasciculare* Olivier, which perhaps is now the latest and most complete description of imago and larvæ of this species. I have since attempted to secure additional specimens of *Nosodendron* larvæ and adults. As a result of my collecting trips in the Philippines one apparently new species of *Nosodendron* has come to light.

For lack of adequate reference, the name given to the present Philippine form has to be considered merely provisional. As to the larvæ of this species, there is not the least doubt that they have not yet been described. The imagines and larvæ of *Nosodendron lentum* sp. nov. prefer *Morus alba* Linn., the Chinese mulberry. They live in the oozing wounds, hidden under detritus. The imago, as well as the larva, is very shy of light. It sometimes also hide behind wood and bark spaces formed and enlarged by the ooze. Adults and larvæ live in association. The larvæ also are found in ooze of *Gliricidia sepium* (Jacq.) Steude., the so-called "madre de cacao," ubiquitous weed tree in the Philippines.

DESCRIPTION OF THE LARVA OF NOSODENDRON LENTUM SP. NOV.

As there are numerous larval sizes in the six instars in Nosodendridæ, the description is confined to a full grown sixth instar larva just before pupation. Length 10 mm, dark brownish gray with maximum width 3 mm in the metathorax and first abdominal segment. Width of head 1.8 mm, about 3 to 4 times its length, uniformly covered with coarse hair-bearing chitinous granulations, which form a characteristic pattern. *Ocelli* six, caudolateral of the antennæ. Immediately caudal is a nearly m-shaped pattern divide of granulation. Directly dorsal in the middle of the head, is a crown-like design, consisting of two round craniomedial dots of thin ungranulated chitin, followed laterally by six elongate dots which become gradually smaller laterally. Entire inter-segmental area bearing elongate dots of alternating sizes.

Antennæ.—Antennæ three-segmented, inserted on top of a protuberance of the head capsule; the antennal segments are freely movable on account of extensive intersegmental conjunctival. The first or proximal segment is cup-like, wider distally and somewhat broader than long. A few (six in the present specimen) hairs, which are fine and relatively long and arcuate, arise on the distal margin towards the middle segment. These hairs measure about one-fourth of the length of middle antennal segment, which is conical, wider distally, apically slightly rounded and more than three times as long as the first segment. Distal (third) segment a tiny, almost inconspicuous bud, and somewhat retracted into the second segment, of which it is only about one-fourth of the average width. Three tiny hairs are situated latero-distal on the third segment.

Mandibles.—The mandibles (ventral aspect) are strongly developed, has proximomedially fine pectinately arranged entoproximal hairs on the molar area, the comb is densely covered with stiff hairs, which reach medially to a row of large tubercles, two-toothed retinaculum, above those hairs we find the nearly two times longer distal tooth rounded apically. The scissorial area is strongly sickle shaped, with a keen margin, strong tubercles covering middle lateral surface of comb. As with all other *Nosodendron* larvæ, mandibles are attached to head capsule by a tricondylic articulation.

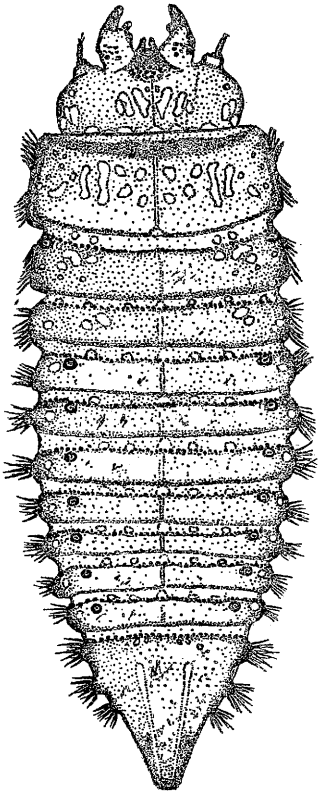


FIG. 1. Larva of *Nosodendron lentum* sp. nov. Sixth instar.

Maxillæ.—The maxillæ have a broad cardo, on which the so-called sub-cardo is indented. The main

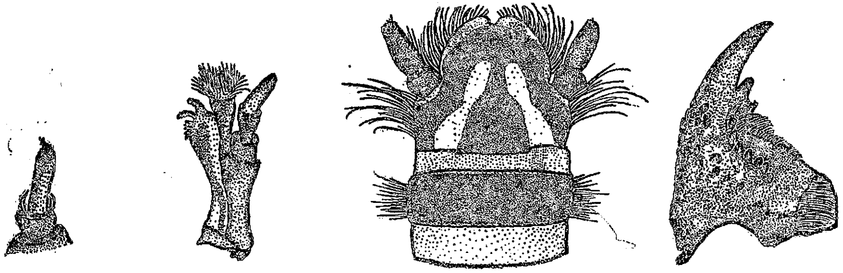


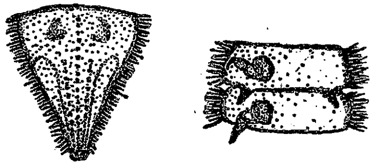
FIG. 2. *Nosodendron lentum* sp. nov.
Mouth parts

part, eucardo, is situated towards the lacinia, the latter is the widest part of the maxilla, it reaches the margin of the last but one palpal segment in height. It is far wider distally than proximally, and not separated from the galea proximally, but galea and lacinia are separated by a suture from palpus. Lacinia strongly rounded distally, with two big distal claw-like processes, which are separated from each other by a deep rounded incision, followed laterally by five strong, thorny hairs. Galea elongate and cup-like, wider distally, exactly as high as lacinia but with brush of long, roughly distributed hairs distally, which make it appear much longer. The palpus is very strong, three-segmented, the processus palpalis maxillæ is widened distally and bears separated by a deep intersegmental skin, the first or proximal palpal segment, which is nearly as wide as long; distal part wide open, with second or middle palpal segment arising on intersegmental skin, leaving a big space around its base in the cup-like end of the first segment; the second segment is cup-shaped and, one and a half of the length of the first and distally twice as wide as proximally; the distal (third) segment is the longest, is twice as long as the first segment, and narrowly cylindrical, slightly narrower distally.

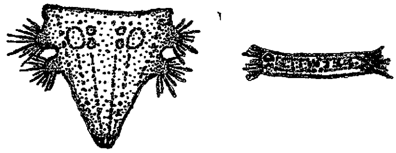
Labium.—The labium covered largely by prementum, which bears long and thin hairs laterally on both sides of the palpi labiales, shorter hairs are on the terminal margin, except for its middle insertion, which is hairless, the margin towards the mentum is in the middle half, slightly protruding. The intersegmental skin towards the mentum and from mentum to submentum is rather extensive; the mentum is little less than one-third of prementum in size; the mentum is oblong-shaped, bears lateral hairs. Mentum and prementum bear long hairs all over their surfaces, [not represented in sketch for clarity.] Palpi labiales are slightly similar to the antennæ in shape, but they consist only of two segments, the proximal segment is somewhat wider than long; it opens slightly towards the second or distal segment, which is conical, with cut-off top, on which are usually three minute hairs.

The thoracic segments are characterized by a skin design which I deem important as a guide in determining *Nosodendron* larvæ. All thoracic segments bear a middle line, a faint thin chitinous partition, which joins exactly to the line of the adjacent segments, and extends throughout the abdominal segments, except the pygidium. It is well known that the chitinous skin splits along this line when the larva moults, so that it can be considered as a preformed place of rupture. The lateral margin of the thoracic segments shows more or less long yellowish brown setæ which extend latero-caudally, lateromedially and also plainly laterally. The prothorax has a very long intersegmental skin towards the head. When the larva contracts, it looks like a kind of collar from which the head arises. To both sides of the middle line there are four nongranular dots, then following laterally on both sides one long, small dot, formed like an Arabic number three and lateral of this an S-shaped bigger one followed by about six smaller round dots to the lateral margin, where a small round dot is situated. The prothorax has no strongly granular horizontal line on its cranial margin, as have the other segments; but on its caudal border we find such a line, distinguishing one segment from the other. The mesothorax bears on its laterocranial margin close to the intersegmental skin the first pair of spiracles, which, are of the atriate open-lip type, like all the abdominal spiracles. They can be regarded as intermediate between normal atriate and atriate-lip type, because the lips are rather wide open. Directly beneath this spiracle, which is round-shaped and has a strong brown chitinous rim, we find three dots of which the middle one is the biggest. Beneath this group of dots there is also a very small one. The metathorax has also the marginal granula line towards the mesothorax and first abdominal segment. The metathorax bears no spiracle; it has the same skin design as the mesothorax but with two extreme lateral dots.

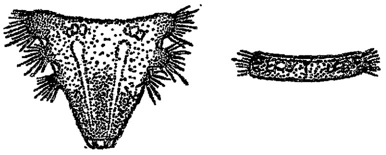
The abdominal segments are nearly equal in shape, but slightly narrowing towards the pygidium. They bear on rounded lateral lobes more or less long yellowish brown setæ. The segments 1 to 7 are provided with spiracles, which are situated dorsolaterally and slightly inclined towards the cranial margin of each segment. The type is the same as the first pair of spiracles, already described. All the seven abdominal segments, but not the pygidium, which is the eight segment, are characterized by a special skin design consisting of chitinous granula, each bearing laterally at the base a single small hair. These granula form certain designs by surrounding zones of thin chitin which bear no granula and only very few small hairs. In the present paper, these plain areas will be called dots. These dots occur also on the lateral margin of the segments just lateral to the spiracle, sometimes also slightly more caudolateral. On the cranial rim of each segment, these dots divide one-half of the segment up to the thin vertical middle line into three parts. Another dot situated on the caudal margin of each segment is not so significant; but it helps to give the impression of a six-division in vertical plane. The combined effect of these dots and lines is to make the skin design of the larva appear somewhat striped. The intersegmental skin also harmonizes with this design; but it is not so keenly coined. Each of the abdominal segments has a horizontally extended line of dark and strong chitin protuberances which are bigger than the granula. This line extends to the cranial margin and ends in the frame of the outermost lateral dot. Between this line and the cranial adjacent segment there are only some very faint chitinous granula forming a loose rounded design. But in general this character cannot be seen in living larvæ because the bodies are not so distended. On the caudal margin of each segment, a line connects both sides and completes the rough design of the segment, but this is not so characteristic as the cranial one. It only determines the boundary of the skin design towards the intersegmental skin. The pygidium is as long as the last two preceding abdominal segments together, terminally pointed and with three characteristic lateral lobes. The first lobe has its origin not entirely laterally; but it arises somewhat lateromedially from a row of stronger setaceous granula on the cranial margin of the pygidium. This lobe is formed like a voluminous hump; it bears on its top slightly laterally decreasing long thin yellowish brown hairs. It is strongly chitinous and without any setaceous granula on its top. The craniolateral lobe covers about one-fifth of the lateral margin of the segment. Then follow laterocaudally a deep trough of nearly half the size of the first lobe and more caudally a second (middle) lobe which is by far smaller than the first one. Its laterocaudal end is situated exactly at the elevation of the middle of the pygidium. The middle lobe is button-like and only slightly protuberant. Separated by a trough-shaped space of about half the size of the middle lobe we find laterocaudal an apparent small lobe. It has the same shape but is of only half the size of the middle lobe, and like the latter it is provided on its top with few hairs. These three lobes are somewhat superficial, so that they do not touch the ground when the larva is moving. Between the lobes the more caudally lying skin can be easily seen. On the distal end of the pygidium we find exactly the same "Stigmenapparatus" i.e., "spiracular apparatus," as with its European relative, *Nosodendron fasciculare* Olivier. That means that the ninth pair of spiracles is situated on the distal side of the pygidium with each of the spiracles lying between one lateral and a medial valve, which can close the aperture of both spiracles entirely. The skin pattern of the pygidium is longitudinally stressed and is also granulated. The border with the preceding seventh segment is well defined by a horizontal row of very dark brown chitinous granula forming a light curvature in the middle somewhat cranially of the segment beneath which, dividing the segment vertically into three nearly equal parts, are two ganula-encircled dots, which are only slightly raised from their surroundings. (These can be regarded as undeveloped "protuberances," found in the other larvæ, e.g., *Nosodendron fasciculare,* very extensively and *Nosodendron unicolor,* only slightly indicated. On either side we find mediolateral vertical stripes which extend from these circular spots to the caudal end of the pygidium, where they end in a semi-lunar thin chitinous patternless zone. Thus the distal end of the pygidium appears light brownish, covered with only very thin chitinous integument. This is because the "terminal spiracle apparatus" works by blood pressure, and so the chitin has to be thin and elastic to a certain degree in order to accommodate the movement of the apparatus. Also, the pygidium bears laterally a few short off stiff yellowish setæ. Ventrally the pygidium is most striking because the lateral margins are smooth and without any protuberances,



Nosodendron fasciculare Olivier



Nosodendron unicolor Say



Nosodendron cimicoides sp. nov.

FIG. 3. Scheme of the different pygidia and the variability in location of spiracles.

which, however, can be seen protruding somewhat from the dorsal side. The other segments bear nothing specially remarkable. Neither the ventral midline nor oval areas observed by Hayes and Chu in *Nosodendron unicolor* could be found.

Having studied histology and physiology of *Nosodendron* larvæ for years, I cannot believe these oval areas to be glandular openings. With the larva of *Nosodendron lentum* the accessory breathing apparatus, a derivative of the final intestine, was also found. This interesting character is already well known in *Nosodendron fasciculare.*

Diagnostic key of Nosodendron larvæ (revision).

(1) a. ninth pair of spiracles situated distally on the pygidium .... (2)
b. ninth pair of spiracles not distal on the pygidium .... (7)
(2) a. Pygidium without lateral lobes .... (3)
b. Pygidium with lateral lobes .... (4)
(3) Pygidium dorsally with two strong chitinous hunchs.
First pair of spiracles ventral on the intersegmental skin between prothorax and mesothorax.
First antennal segments distally not setaceous.
Tab. I.—*Nosodendron fasciculare* Olivier
(4) a. Pygidium with two lateral lobes .... (5)
b. Pygidium with three lateral lobes .... (6)
(5) First pair of spiracles on the auterolateral angle of the mesothorax.
First antennal segment distally strongly setaceous.
Tab. II—*Nosodendron unicolor* Say
(6) First pair of spiracles like (5).
First antennal segment distally with few long and thin hairs.
Tab. III—*Nosodendron lentum* sp. nov.
(7) Pygidium with cerci, chitinous hunchs dorsally only faintly indicated.
First air of spiracles lateral between prothorax and mesothorax.
First antennal segment non setaceous.

REFERENCES

BLATCHLEY, W. S. An illustrated catalogue of the coleoptera or beetles—known to occur in Indiana. Ind. Geol. and Nat. Resources (1910) 672.

BÖVING, A. G., and F. C. CRAIGHEAD. An illustrated synopsis of the principal larval forms of the order Coleoptera. Ent. Am. 11 (1931) 1–351, *125 plates.*

CHAPUIS, F., and E. CANDÈZE. Catalogue des larves des coléopteres etc. Liège H. Dessain Extr. Mem. Soc. Royal Sci. de Liège 8 (1853) 445–46.

DUFOUR, L. Description de la larve du *Nosodendron.* Soc. Ent. France Ann. § 4, 2 (1862) 146–149.

GANGLBAUER, L. Die Kaefer von Mitteleuropa 4 (1904) 88. Wien C. Gerold's Sohn.

HAYES, W. M. P., and H. F. CHU. The larvæ of the genus *Nosodendron* Latr. Ent. Soc. Am. Ann. (1946) 69–79.

HORN, G. H. Descriptions of new species of the United States Coleoptera. Amer. Ent. Soc. Trans. 5 (1874) 20–43.

KUHNT, P. Illustrierte Bestimmungstabellen der Kaefer Deutschlands, Stgt. (1913) 1138.

LABOULBÈNE, A. Sur les stigmates de la larve du *Nosodendron fasciculare* Ent. Soc. Fr. Ann. § 4, 2 (1862) 149–152.

LUCUS, R. Catalogue alphabeticus generum et subgenerum coleopterum orbis terraneum totius Bln. 1 (1920) 443.

OEHME, B. G. Biologie und Antomie des Baumflusskaefers *Nosodendron fasciculare*. Oliv., Diss. Erlangen, Germany, 1948.

OEHME, B. G. Zur Frage der Enddarmresorption bei Insekten. Verh. d. deutsch Zoologen in Mainz, 1949. Academ. Verlagsges. Geest und Portig Leipzig, 1948.

OEHME, B. G. Eine Oeldruese bei der Imago von *Nosodendron fasciculare* Ent. Bltt. 45–46 (1950) 12–14.

SNODGRASS, R. E. Principles of insect morphology. N. Y. and London, Mc-Graw-Hill Book Company, Inc., 1935.

RECORDS AND DESCRIPTIONS OF JAPANESE TIPULIDÆ (DIPTERA), PART III

THE CRANE-FLIES OF SHIKOKU, III.

By CHARLES P. ALEXANDER
Of Amherst, Massachussetts

FIVE PLATES

The present paper is a continuation of the report on the rich crane-fly fauna of Shikoku, the plans for which were detailed in the initial paper under this general title. The materials discussed were taken chiefly by Professors Issiki and Ito in 1950 and 1951, and by Professor Ishihara and Mr. Yano in 1952. Fewer specimens were secured by other entomologists, including Professor Miyatake and Messrs. Edashige, Kusunoki and Takechi. I am very deeply indebted to all of the foregoing friends and co-workers for this continued interest in saving these fragile and only too often neglected flies. Through their generosity I have been permitted to retain the types of the new species in my personal collection. The present record brings the list of Tipulidæ at present known from Shikoku from 135 to 210 species, with the certainty that many more species remain to be found here, particularly in the higher mountains. During 1952, the entomologists of the Shikoku Entomological Society paid particular attention to the survey of the Omogo Valley and Mount Ishizuchi, endeavoring to indicate the peculiar richness of this part of Iyo and the desirability of having parts of it conserved as a national park. As a result of this detailed survey, no fewer than 108 species of Tipulidæ were discovered, the list of which will be published separately in 1953.

RECORD OF DISTRIBUTION

TIPULINÆ

136. **DOLICHOPEZA (NESOPEZA) ALBITIBIA (Alexander).**

Nesopeza albitibia ALEXANDER, Insec. Inscit. Menst. 10 (1922) 187.
Nesopeza albitibia ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1529, *fig.*

The type was from Mount Ibuki, Honshu, taken June 4, 1921, by Takeuchi.

IYO: Omogokei, June 5, 1952 (*Yano*).

137. **DOLICHOPEZA (NESOPEZA) TARSALIS (Alexander).**

Nesopeza tarsalis ALEXANDER, Ann. Ent. Soc. America 12 (1919) 347.

The types were from Saitama, Honshu, taken May 29, 1919, by Takahashi.

IYO: Omogokei, July 14, 1952 (*Yano*).

The present specimen differs from the type in slight details of the male hypopygium, the most evident being the apparently smooth lateral lobes of the ninth tergite which in the type bear small blackened marginal tubercles.

138. MACGREGOROMYIA SHIKOKUANA sp. nov. Plate 1, figs. 1, 8.

General coloration brown, the front obscure yellow; mesonotal præscutum with three darker brown stripes, the median one with a more darkened central line on the anterior fourth; wings tinged with grayish, the stigma and a seam over the cord darker; male hypopygium with the tergal lobes large, their apices narrowly rounded, the median lobe very reduced; inner dististyle with the posterior crest relatively small, beak slender, lower beak very deep, acutely pointed at tip.

Male.—Length, about 10 millimeters; wing, 11.5; antennæ about 3.

Frontal prolongation of head obscure yellow above, including the long nasus, dark brown on the sides; palpi pale at base, the third segment and base of fourth more blackened, the remainder of the latter brownish yellow. Antennæ thirteen-segmented; scape and pedicel yellow, flagellum dark brown; flagellar segments cylindrical with very short verticils; terminal segment reduced to a tiny thimble. Head dark brown, the front and anterior vertex obscure yellow; posterior orbits very narrowly yellowed.

Pronotum brown. Mesonotal præscutum brown, gray pruinose especially laterally, with three darker brown stripes, the median one with a short blackened central streak on anterior fourth; posterior sclerites of notum brown, sparsely pruinose. Pleura obscure buffy yellow, the propleura, anterior anepisternum, ventral sternopleurite and meron more infuscated; dorsopleural membrane yellow. Halteres elongate, stem yellow, knob infuscated. Legs with the coxæ yellow, the fore pair darker; trochanters obscure yellow; femora dark brown, the bases broadly more yellowed; tibiæ and tarsi brownish black to black; claws small, simple. Wings (Plate 1, fig. 1) tinged with grayish, the oval stigma darker brown, preceded and followed by small whitish areas, the latter larger; narrow, inconspicuous brown seams over the cord, particularly the anterior cord; small and vague whitish spots near outer end of cell M and in basal portions of cells 2nd M_2 and M_3; veins brown. Venation: Rs nearly transverse; basal section of R_{4+5} short; cell 1st M_2 small less than the petiole of cell M_1.

Abdomen brown, the sternites somewhat paler; hypopygium dark brown. Male hypopygium (Plate 1, fig. 8) with the tergal lobes, *9t,* large, their apices narrowly rounded, median lobe very reduced. Outer face of basistyle, *b,* with abundant long coarse setæ. Outer dististyle, *d,* about four times as long as broad, obtuse at tip. Inner dististyle with the posterior crest relatively small, beak slender, lower beak very deep, acutely pointed at tip.

Habitat.—Japan (Shikoku).

Holotype, male, Omogokei, July 14, 1952 (*Yano*).

This is the first species of the genus to be described from Japan, but I have on hand two further species from Kyushu, discovered by Issiki and Ito, that will be described in the immediate future. The genus was originally described from Luzon, with species later being discovered in the Malay Peninsula, in China, as far west as Szechwan, and more recently in the higher mountains of Fukien Province, eastern China. However, no representatives of the genus have yet been found in Formosa. Its discovery in Japan was most noteworthy. The present fly differs evidently from all related forms in the structure of the male hypopygium, particularly the tergite and inner dististyle.

139. NEPHROTOMA BIFUSCA Alexander. Plate 1, fig. 9.

Nephrotoma bifusca ALEXANDER, Trans. Amer. Ent. Soc. 46 (1920) 25–26.

The type was from Kyoto, Honshu, taken May 27, 1914, by Nohira.

IYO: Minara, May 11, 1952 (*Yano*).

Male hypopygium (Plate 1, fig. 9) with the tergite, *9t,* transverse, gradually narrowed outwardly, the posterior border with a deep U-shaped emargination; lateral lobes extensive, transverse, with abundant black spicules. Basistyle, *b,* small and simple. Outer dististyle, *d,* about three times as long as broad, widest just beyond base, the apex obtuse. Inner dististyle, *d,* small and compact, without developed crests; beak long and powerful, more or less cultrate, the dark color continued around the outer margin of style to beyond the summit where there is a group of about a dozen setæ; lower beak small; face of style back from the lower beak produced into a darkened lobe. Gonapophysis, *g,* small, appearing as a pale elongate blade, the tip obtuse, subequal to or a little shorter than the ædeagus. Eighth sternite, *8s*, broadest across the posterior border, the caudal margin truncate; disk with numerous small setæ, even more abundant near the central part of the posterior region but not forming a tuft or brush.

140. NEPHROTOMA IYOENSIS, sp. nov. Plate 1, fig. 10; Plate 2, fig. 14.

Allied to *akitæ;* general coloration pale yellow, the præscutum with three polished black stripes; head with the occipital brand very large; wings subhyaline, the stigma and restricted seams over the anterior cord and at wing tip darker brown; ovipositor with cerci and hypovalvæ short and deep; male hypopygium with the lateral plates of the ninth tergite large and conspicuous; inner dististyle subquadrate, the beak slender; gonapophyses appearing as long-oval blades, provided with delicate pale setulæ; eighth sternite large and sheathing, the apical half with median pale membrane, the lateral lobe unarmed.

Male.—Length, about 13 millimeters; wing, 12; antenna, about 5.

Female.—Length, about 14 millimeters; wing, 15.

Frontal prolongation of head light yellow, dark brown above, including the long nasus; palpi dark brown. Antennæ (male) with the scape reddish yellow, pedicel darkened, the apex paler, flagellum black; flagellar segments only moderately incised, the basal swellings relatively small; longest verticils only a trifle less than the segments. Head light yellow; a conspicuous dark spot on sides of anterior vertex adjoining the eyes; occipital brand very large, its caudal or central part glabrous, broadly margined by brown.

Pronotum light yellow medially, the scutum black on sides. Mesonotal præscutum light yellow with three polished black stripes, the median one entire, reaching the suture behind; lateral stripes not outcurved but with a pale brown cloud opposite the anterior end, this not reaching the margin; scutum pale yellow, each lobe with a large black area; scutellum and postnotum pale yellow, the mediotergite a trifle more reddened medially, its posterior fourth infuscated; scutellum and postnotum with long pale setæ. Pleura and pleurotergite pale yellow variegated with black, including major areas on the ventral anepisternum, ventral sternopleurite and meron, with smaller areas along the suture between the mesepisternum and mesepimeron, as well as the extreme ventral katapleurotergite. Halteres yellow. Legs with the fore coxæ gray, narrowly pale at apex, the remaining coxæ gray basally, the tips broadly pale, particularly those of the hind coxæ; trochanters yellow; femora obscure yellow basally, the tips blackened, broadest on the fore legs where about the outer two-thirds is included, narrowest on the posterior femora where about the outer fourth is darkened; tibiæ pale brown, darker apically; tarsi black; claws (male) toothed. Wings subhyaline, the prearcular and costal fields a trifle more yellowed; stigma oval, dark brown, with abundant trichia on the posterior and basal portions; a restricted dark cloud on the anterior cord, wing tip narrowly darkened; veins brown, a trifle paler in the more brightened portions. Venation: Rs about twice as long as the basal section of R_{4+5}; cell M_1 very short-petiolate to nearly sessile; m-cu on M_4 close to the base.

Abdominal tergites yellow, patterned with brownish black, especially a broad dorsal stripe, the outer segments uniformly blackened. The female is teneral and the intensely black pattern of the thorax and abdomen of the male is here pale reddish. Ovipositor (Plate 2, fig. 14) with the cerci, *c*, short and deep, narrowed to the obtuse tips, the surface with abundant pale setæ and with about three long blackened bristles on the face; hypovalvæ, *h*, sclerotized, having somewhat the same general outline as the cerci, decurved and narrowed to the pale obtuse tips. Male hypopygium (Plate 1, fig. 10) with the ninth tergite, *9t*, transverse, the caudal margin with a very broad and shallow emargination, the lobes narrow, terminating in only a few points, with sparse blackened spicules on the ventral surface; more laterally a conspicuous compressed plate on either side, this provided with abundant blackened spicules. Outer dististyle, *d*, narrow, its length nearly five times the greatest width, the outer fourth narrowed. Inner dististyle, *d*, subquadrate in outline, much deeper than in *akitæ;* beak long and slender; dorsal crest very low. Gonapophysis, *g*, appearing as a long oval blade that is covered with delicate pale setulæ. Eight sternite, *8s*, large and sheathing, narrowed outwardly the apical half medially with pale membrane, the short blunt lateral lobes without sclerotized points, as in *akitæ*.

Habitat.—Japan (Shikoku).

Holotype, male, Sarangamine, Iyo, altitude, 1,200 meters. June 3, 1952 (*Ishihara*). Allotopotype, teneral female, altitude, 1,100 meters.

The most similar species is *Nephrotoma akitæ* Alexander which is evidently closely allied, differing in the details of structure of the ovipositor and the male hypopygium.

141. NEPHROTOMA MINUTICORNIS Alexander. **Plate 1, fig. 11.**

Nephrotoma minuticornis ALEXANDER, Ann. Ent. Soc. America 14 (1921) 134.

Nephrotoma minuticornis ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1533, *fig.*

Nephrotoma minuticornis SHIRAKI, Cat. Injur. Ins. Japan 5 (1952) 109.

The type, a male, was from Sapporo, Hokkaido, collected by Kuwayama. The species is likewise known from Karafuto.

IYO: Matsuyama, May 25, 1952 (*Yano*).

Male hypopygium (Plate 1, fig. 11) with the ninth tergite, *9t,* large, the posterior border with a broad V-shaped notch, the rounded lobes with numerous blackened spicules; apex of each lobe farther produced into a spiculose lobule. Basistyle, *b,* on mesal face with a pair of sclerotized plates that are only slightly darkened. Outer dististyle, *d,* strongly narrowed on outer third. Inner dististyle, *d,* with the beak slender; crest very high but subhyaline and sometimes almost invisible, the elevated smooth anterior part extending forward almost to the apex of the beak, the crest becoming lower behind, its margin here irregularly serrulate or erose. Gonapophysis, *g,* appearing as a pale blade, the outer end curved to the acute tip. Eighth sternite, *8s,* large and sheathing, the posterior border deeply notched, the extensive yellow lobes provided with abundant long yellow setæ that are decussate across the midline; in the membrane that fills the emargination with a small suboval lobe.

The species is of minor economic importance, the larvæ causing some damage to sugar beets in Hokkaido, where it is known as the sugarbeet crane-fly, Ao-hoso-gagambo (Makiba-gagambo)-*Shiraki.*

142. TIPULA (SCHUMMELIA) ACIFERA Alexander.

Tipula acifera ALEXANDER, Philip. Jour. Sci. 31 (1926) 377–378, *pl. 1, fig. 10* (venation).

Tipula (*Schummelia*) *acifera* ALEXANDER, Philip. Jour. Sci. 57 (1935) 102.

IYO: Ishizuchi, altitude 1,000 meters, August 10, 1925 (*C. Harukawa*); type.

143. TIPULA (SCHUMMELIA) ECAUDATA Alexander. **Plate 2, fig. 12.**

Tipula ecaudata ALEXANDER, Ann. and Mag. Nat. Hist. (9) 14 (1924) 474–475.

Tipula (*Schummelia*) *ecaudata* ALEXANDER, Philip. Jour. Sci. 57 (1935) 102.

The species was described from Karafuto and Honshu.

IYO: Omogokei, May 11, 1952 (*Ishihara*).

The inner dististyle of the male hypopygium is shown (Plate 2, fig. 12).

144. TIPULA (SCHUMMELIA) ISHIZUCHIANA sp. nov. Plate 1, fig. 2.

Allied to *variicornis;* mesonotal præscutum yellow laterally, with three brown discal stripes; antennal flagellum brownish black; legs black, the femoral bases brownish yellow; wings chiefly infuscated, the color chiefly produced by broad dusky seams over the veins; cell M_1 barely sessile to very short-petiolate.

Female.—Length, about 14 millimeters; wing, 15.

Frontal prolongation of head dark brown; nasus elongate; palpi dark brown. Antennæ with the long scape darkened above, yellowed beneath, pedicel light yellow, flagellum brownish black. Head dark brown, the posterior orbits broadly orange; vertical tubercle lacking.

Pronotum brown medially, brownish yellow on sides. Mesonotal præscutum yellow, the lateral and humeral portions broadly and conspicuously so, the disk with three brown stripes, the central one paler medially and more or less divided by a capillary pale line; central region of scutum light yellow, centers of lobes darker, more intensely so near the suture; scutellum testaceous yellow; mediotergite pale brown with a vague more yellowed central line; anapleurotergite dark brown, the katapleurotergite yellow; vestiture of mesonotum long and conspicuous, especially so on the scutum and mediotergite. Pleura dark brown, the pteropleurite chiefly paler; dorsopleural membrane infuscated. Halteres with stem weakly infuscated, its base and the knob obscure yellow. Legs with the coxæ infuscated, the apices of the middle and posterior pairs yellowed; trochanters yellow; femora brownish yellow, the tips narrowly blackened; tibiæ and tarsi black. Wings (Plate 1, fig. 2) chiefly infuscated, the color produced by broad dusky seams over the veins, the color deeper and more conspicuous on the outer half of wing; darkened seam over m-cu broad; pale areas restricted, appearing chiefly as prestigmal and poststigmal brightenings; an obliterative area across cell 1st M_2 and a major spot near outer end of cell M; less evident brightenings behind vein Cu and in cell 1st A near the tip of vein 2nd A; cell C and prearcular region more brownish yellow; veins dark brown, the arcular region restrictedly more yellowed. Venation: Cell M_1 barely sessile to very short-petiolate.

Abdomen obscure yellow, the segments patterned with brown, including the central and posterior parts of the segments, the yellow bases becoming more restricted on the outer segments. Ovipositor with the cerci exceedingly slender on about the distal half.

Habitat.—Japan (Shikoku).

Holotype, female, Mount Ishizuchi, summit, altitude 1,981 meters, July 27, 1952 (*Ishihara*).

The only other regional member of the subgenus having cell M_1 sessile or subsessile is *Tipula* (*Schummelia*) *variicornis* Schummel (*latiligula* Alexander), which differs especially in the coloration of the body, legs, antennæ and wings.

145. TIPULA (SCHUMMELIA) SARAGAMINENSIS sp. nov. Plate 1, figs. 3, 13.

General coloration of mesonotum very pale yellow, the præscutum with four dark gray stripes that are narrowly bordered by blackish; antennal flagellum brownish black; head light yellow, the suborbital parts of the vertex patterned with brown; postnotum and pleura chiefly dark brown; femora yellow, the tips conspicuously blackened; wings subhyaline, restrictedly patterned with weak brown areas and whitish spots; petiole of cell M_1 at least twice m; male hypopygium with the inner dististyle bearing a high glabrous dorsal crest.

Male.—Length, about 12 millimeters; wing, 13; antenna, about 4.

Frontal prolongation of head a little shorter than the remainder, yellow above, including the nasus, dark brown on sides and beneath; palpi brownish black, the terminal segment paling to reddish. Antennæ with scape obscure yellow, weakly infuscated outwardly; pedicel testaceous, flagellum brownish black; flagellar segments with basal swellings poorly indicated, verticilis a little shorter than the segments. Head light yellow, with a conspicuous dark brown stripe on the sides of the posterior vertex, paralleling the inner margin of the eye. the posterior orbits remaining pale, the dark vitta touching the eye at its anterior end; vertical tubercle low and inconspicuous.

Pronotum light yellow medially, weakly infuscated on sides. Mesonotal præscutum with the lateral and humeral portions very pale yellow, the disk with four dark gray stripes that are narrowly margined with blackish, the stripes nearly confluent at their anterior ends, the posterior interspaces obscure; scutal lobes dark gray, the restricted median area more yellowed; scutellum weakly infuscated, the parascutella darker; mediotergite dark brown, with a vague and narrow paler median vitta;

pleurotergite dark brown, the swollen katapleurotergite light yellow. Pleura with the pteropleurite yellow, the remainder chiefly dark brown, the dorsal portions of the anepisternum, sternopleurite and meron yellow; dorsopleural membrane extensively infuscated. Halteres with stem weakly infuscated, knob yellow. Legs with the coxæ darkened basally, pale at tips, more extensively so on the fore and middle pairs; trochanters obscure yellow; femora obscure yellow, somewhat clearer basally, the tips conspicuously blackened, involving about the outer fifth or less; tibiæ and tarsi black; claws (male) toothed. Wings (Plate 1, fig. 3) subhyaline, restrictedly patterned with weak brown areas and whitish spots; stigma oval, dark brown; the most conspicuous dark seams lie over m-cu and near tip of vein Cu and as a narrow marginal cloud in the distal ends of the outer radial cells; the most evident whitened areas include prestigmal and poststigmal brightenings, across cell 1st M_2, before and beyond m-cu, especially the former, and at outer end of cell 1st A adjoining vein 2nd A; prearcular and costal fields a trifle more brownish yellow; veins brownish black, paler in the brightened areas, particularly at the wing base. Venation: Rs a little exceeding the long m-cu, the latter shortly before the fork of M_{3+4}; petiole of cell M_1 from two to three times m.

Abdominal tergites beyond the second conspicuously bicolored, the bases yellow, the subequal apices dark brown; outer segments more extensively darkened; basal sternites more uniformly yellow; outer segments brownish black, forming a subterminal ring. Male hypopygium (Plate 2, fig. 13) with the ninth tergite, *9t*, black, transverse, the caudal margin very gently emarginate, with indications of a very small and inconspicuous median lobe. Outer dististyle, *d*, about five times as long as broad. Inner dististyle, *d*, high, the beak relatively stout, the blackened margin of the style simple; dorsal crest high and glabrous, the setæ remote from the margin, face of disk with abundant strong yellow setæ that are directed backward. In *ecaudata*, the dorsal crest of the inner dististyle (Plate 2, fig. 12, *d*) is low to virtually lacking, being best indicated posteriorly, the discal setæ thus lying closer to the margin; inner margin of style with an internal ridge, the whole outer face between it and the margin blackened.

Habitat.—Japan (Shikoku).

Holotype, male, Saragamine, Iyo, altitude 500 meters, April 16, 1952 (*Ishihara*).

The most similar regional species are *Tipula* (*Schummelia*) *ecaudata* Alexander and *T.* (*S.*) *querula* Alexander, which differ in the details of coloration and structure of the male hypopygium.

146. TIPULA (YAMATOTIPULA) AINO Alexander.

Tipula aino ALEXANDER, Can. Ent. 46 (1941) 209–210, *pl. 16, fig. 3* (wing), *pl. 19, figs. 4, 5* (♂ hypopygium).

Tipula (*Yamatotipula*) *aino* ALEXANDER, Philip. Jour. Sci. 57 (1935) 108.

Tipula aino ESAKI, et al., Icon. Insect, Japon. Ed. 2 (1950) 1534, *fig.*

Tipula aino SHIRAKI, Cat. Injur. Ins. Japan 5 (1952) 109.

Originally described from material taken in the vicinity of Tokyo by Kuwana and assistants. It is now known to be destructive to rice, and has been given the name of rice crane-fly, with Japanese names of Kiriuji-gagambo (Ine-kiriuji Gagambo; Ka-no-uba; Ka-tombo; Kiriuji and Nekiri-uji)-*Shiraki*. In addition to attacking rice, the species has been recorded as affecting wheat, barley, lilies, pear, tobacco, mulberry, Japanese cedar, wasabi and East Indian lotus.

TOSA: Totidani, near Yanase, altitude 400 meters, May 2, 1951 (*Issiki-Ito*).

A considerable volume of literature has accumulated on this crane-fly and I am indebted to Professor Masaki and Professor Kuwayama for sending me lists of the more important references which are supplied herewith in order to make them more available to western entomolgists. The present bibliography is the one furnished me by Kuwayama and includes not only references to the present species, but also to *Tipula* (*Yamatotipula*) *latemarginata* Alexander and *Nephrotoma minuticornis* Alexander, both species of lesser importance. References in general text-books and taxonomic papers are excluded from the following record:

A BIBLIOGRAPHY OF CRANE-FLIES OF ECONOMIC IMPORTANCE IN JAPAN (SATORU KUWAYAMA)

HARUKAWA, C., and S. KUMASHIRO. On the rice crane-fly. I. Life-history. Nogaku Kenkyu (Agr. Res.) 26 (1936) 449–490.

HARUKAWA, C., and S. KUMASHIRO. On the rice crane-fly. II. Relation between the post-embryonic development and the conditions of environment. Nogaku Kenkyu 27 (1937) 1–71.

HARUKAWA, C., and S. KUMASHIRO. On the rice crane-fly. III. Controlling measures: A preliminary report. Nogaku Kenkyu 28 (1938) 305–332.

HARUKAWA, C. Control measures against crane-flies with chemicals. Byochugai Zasshi (Jour. Plant Protect. (1) 25 (1938) 9–14.

IMAI, K. New insecticides against crane-fly larvæ in paddy nurseries. Byochugai Zasshi (10) 25 (1938) 754–761.

KARIYA, S. On the scientific name of the rice crane-fly. Konchu Sekai (Ins. World) 36 (1932) 195–201.

KUWAYAMA, S. A list of the insects injurious to agricultural and horticultural plants in Hokkaido. Bull. Hokkaido Agr. Expt. Sta. 42 (1926) 73 (*Nephrotoma minuticornis* Alexander as a pest of sugar beet).

KUWAYAMA, S. The principal insect pests of the rice plant in Hokkaido. Bull. Hokkaido Agr. Expt. Sta. 47 (1928) 17–20; as *Tipula parva* Loew).

KUWAYAMA, S. Paddy rice pests. Insect pests and diseases of paddy rice. Hokuno, Ser. 1 (1946) 59–117 (*Tipula latemarginata* Alexander, the smaller rice crane-fly, 72–74).

MASAKI, J. Life-history of *Tipula aino* Alexander. Mushi (Insecta) (1) 3 (1930) 37–38.

MASAKI, J. On the life-history of *Tipula aino* Alexander (Tipulidæ, Diptera). First Report. Nogyo and Engei (Agr. and Hort.) 8 (1933) 1441–1450, 1649–1656, 1880–1888.

MITONO, T., and T. HORIUCH. Experiments on the control of crane-flies with DDT. Noken (Agr. Res.) 3 (1948) 6–13.

MURATA, J. Report on experiments for the control of crane-flies. Nagano Agr. Expt. Sta., Misc. Rept. 1 (1924) 45–48.

NAGANO, K. Outbreak of crane-flies in Gifu Prefecture. Konchu Sekai 20 (1916) 303–305.

NOZU, R. On the barley and wheat crane-fly. Kenshu, No. 381 (1941) 7–10.

NOZU, R. Results of experiments on the control of crane-flies. Kenshu, No. 404 (1943) 1–9.

ONUKI, S. The crane-fly of rice. Imper. Centr. Agr. Expt. Sta. Circ. 10 (1901) 1–18, *1 pl.*

ONUKI, S. Crane-fly. Imper. Centr. Agr. Expt. Sta. Rept. 30 (1904) 5–9.

ONUKI, S. On a crane-fly. Imper. Centr. Agr. Expt. Sta. Bull. (1) 1 (1906) 90–94; in English.

OTA, Y. Experiments with insecticides against the barley and wheat crane-flies. Konchu Sekai (532) 45 (1941) 363–365.

SEKIYA, H. Studies on the biology and control measures of the rice crane-fly, *Tipula aino* Alexander. Toyama Agr. Expt. Sta., Spec. rept. (1950) 1–16, *4 pls.* (1 in color).

SUGIYAMA, S. Crane-fly and cricket. In Yuasa-Kawada's Synopses insect pests of agriculture in Japan (1952) 132–137.

Except where stated to the contrary, all papers in the above list are printed in Japanese.

147. TIPULA (INDOTIPULA) TETRACANTHA Alexander.

Tipula tetracantha ALEXANDER, Philip. Jour. Sci. 35 (1928) 457–458, *pl. 2, fig. 13* (♂ hypopygium).

The type was a unique male, in alcohol from an unspecified locality in Shikoku, taken July 4, 1926, by Issiki. More recently it has been taken in Honshu and Kyushu.

IYO: Omogokei, June 6, 1952 (*Yano*).

148. TIPULA (ACUTIPULA) KUZUENSIS Alexander.

Tipula kuzuensis ALEXANDER, Jour. N. Y. Ent. Soc. 26 (1918) 69.
Tipula (*Acutipula*) *kuzuensis* ALEXANDER, Philip. Jour. Sci. 57 (1935) 109.
Tipula kuzuensis ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1536, *fig.*

The type, a male, was from Kuzu, Shinano, Honshu, taken August 4, 1914, by Nohira. The fly is wide-spread in the mountains of Honshu.

IYO: Ishizuchi, altitude 1,900 meters, July 27, 1952 (*Ishihara*).

149. TIPULA (TIPULODINA) JOANA Alexander.

Tipula joana ALEXANDER, Ann. Ent. Soc. America 12 (1919) 347–348.
Tipula (*Tipulodina*) *joana* ALEXANDER, Philip. Jour. Sci. 57 (1935) 116.

The types were from Meguro, Tokyo, taken April 23, 1919, by Takahashi.

IYO: Matsuyama, April 19, 1952 (*Ishihara*).

150. TIPULA (OREOMYZA) AUTUMNA Alexander.

Tipula autumna ALEXANDER, Ann. Ent. Soc. America 14 (1921) 126–127.
Tipula (*Oreomyza*) *autumna* ALEXANDER, Philip. Jour. Sci. 57 (1935) 122.

IYO: Dogo, Matsuyama, November 29, 1946 (*Yano*); Matsuyama, at light trap, October 11 to 20, 1948 (*Ishihara-Miyatake*).

151. TIPULA (OREOMYZA) FLAVOCOSTALIS Alexander.

Tipula flavocostalis ALEXANDER, Ann. Ent. Soc. America 14 (1921) 124–125.
Tipula (*Oreomyza*) *flavocostalis* ALEXANDER, Philip. Jour. Sci. 57 (1935) 122.

AWA: Mount Tsurugi, altitude 1,400 to 1,950 meters, May 31, 1950 (*Issiki-Ito*).

IYO: Mount Iwaya, May 22, 1949 (*Miyatake*); Mount Saragamine, June 2, 1951 (*Miyatake*).

152. TIPULA (OREOMYZA) IMANOENSIS sp. nov. Plate 2, fig. 15.

Allied to *yusou;* mesonotal præscutum light gray with three dark brown stripes, the median one divided on its anterior half by a more blackened central vitta; femora yellow, the tips blackened; wings pale yellow, the prearcular and costal fields more saturated, the disk with paler brown clouds, including the broad wing tip; basad of cord the dark wing pattern very restricted except in outer end of cell 1st A; basal abdominal tergites yellow, trivittate with brown, the median stripe broad, outer segments dark brown; male hypopygium with the tergite produced into two sublateral points with a microscopic median denticle; outer dististyle very broad; inner dististyle with the outer basal lobe a stout blackened spine; eighth sternite with the median lobe low, its margin with 30 to 35 stout yellow setæ the surface of the lobe with small scattered setæ only.

Male.—Length, about 18 millimeters; wing, 19.5; antenna, about 4.

Frontal prolongation of head elongate, approximately equal to the remainder, dark plumbeous gray, without nasus; palpi brownish black. Antennæ (male) with scape and pedicel yellow, first flagellar segment brownish yellow, remaining segments very feebly bicolored, dark brown, the basal swellings more blackened; flagellar segments rather strongly incised, subequal to the longest verticils. Head gray with the vaguest indications of a darker line on vertex, extending from the small entire tubercle to midlength of the posterior vertex.

Pronotum dark gray, narrowly darkened medially, paling to light gray on sides. Mesonotal præscutum light gray, with three dark brown stripes, the median one divided on its anterior half by a more blackened central vitta, bordered on either side by a slightly paler gray line; interspaces more suffused, especially the posterior portion; posterior sclerites of notum gray, each lobe with two separate pale brown areas; a vague darkened central line on scutellum. Pleura and pleurotergite light gray, the dorsopleural membrane yellow. Halteres yellow, the knob weakly more darkened. Legs with the coxæ light gray pruinose; trochanters yellow; femora yellow, the tips blackened; tibiæ and tarsi black, the bases of the former somewhat brightened; claws (male) toothed. Wings pale yellow, the prearcular and costal fields more saturated yellow; stigma dark brown, its proximal end more yellowed; paler brown clouds include the broad wing tip, a relatively narrow band before the cord and restricted clouds before the cord, most extensive in outer end of cell 1st A; veins brown, more yellowed in the saturated fields. Venation: Rs about two and one-half times m-cu; R_{1+2} entire; cell M_1 deep, its petiole subequal to or shorter than m.

Abdominal tergites yellow, trivittate with brown, including a broader median stripe that is narrowly interrupted at the posterior border of each segment and vague sublateral stripes, the lateral borders broadly, the posterior margins more narrowly light gray; basal sternites brownish yellow, the outer segments, including the hypopygium, dark brown. Male hypopygium (Plate 2, fig. 15) with the ninth tergite, *9t*, transverse, suddenly narrowed outwardly, the posterior margin truncate, blackened, produced into two sublateral black points, with a microscopic median denticle; back from the border with a broad yellowed area, provided with numerous setæ, the outermost smaller. Outer dististyle, *d*, unusually short and broad, the width across the truncated apex exceeding the lower edge and only a little less than the upper one. Inner dististyle with the beak obtuse, the dorsal crest with conspicuous parallel ridges or corrugations; lower beak very obtuse; outer basal lobe appearing as a stout blackened spine, narrowed to the subacute point. Gonapophysis smaller than in *yusou* and allies, the outer blades obtuse, the inner appearing as a decurved black spine. Eighth sternite, *8s*, distinctive, the median lobe low, with a marginal fringe of about 30 to 35 stout yellow setæ, the lateral ones small and weak, the central ones largest; surface of lobe immediately back from the margin glabrous, the dorsal surface behind the lobe with small scattered setæ only.

Habitat.—Japan (Shikoku).

Holotype, male, Iwai, near Imanoyama, Tosa, altitude 200 meters, May 11, 1951 (*Issiki-Ito*).

Although allied to *Tipula* (*Oreomyza*) *yusou* Alexander and some other related species, the present fly seems obviously distinct by the structure of the male hypopygium, particularly the ninth tergite, outer dististyle and eighth sternite.

153. TIPULA (OREOMYZA) ISHIHARANA Alexander. Plate 1, fig. 4.

Tipula (*Oreomyza*) *ishiharana* ALEXANDER, in press.

Size large (wing, female, 15 mm); general coloration gray, the vertex and thoracic dorsum with a nearly continuous capillary median vitta; antennæ with proximal eight or nine segments yellow; mesonotal præscutum with a trifid darkened pattern additional to numerous confluent setigerous punctures on the interspaces; knobs of halteres dark brown; legs black; wings whitish, with four conspicuous brown crossbands, cell Sc and the posterior prearcular field yellow; squama with sparse setæ; R_{1+2} atrophied; abdominal tergites two and three yellow, the remainder darker, with a conspicuous brown median stripe; cerci long and straight.

Female.—Length, about 17 millimeters; wing, 15; antenna, about 2.5.

Wings (Plate 1, fig. 4) with the ground color whitish, conspicuously crossbanded with brown, the first dark band just beyond arculus, the second at origin of Rs, third over the anterior cord, in outer end of cell M and including all of cell M_4; outer dark crossband involves the broad wing tip; stigma and cell C dark brown, cell Sc and prearcular field conspicuously yellow; the white ground areas include the posterior prearcular field in bases of anal cells, two narrow interrupted bands before the cord, alternating with the darkened ones, and a virtually complete crossband beyond the cord, reaching the posterior border in cell M_3 but narrowly interrupted by a dark seam over M_{1+2}; veins beyond cord brown, Sc and veins in the pale interspaces basad of cord yellow. Squama with two strong black setæ. Venation: R_{1+2} atrophied or virtually so; Rs long, nearly three times m-cu, the latter only a little longer than M_{3+4}; m-cu just beyond the base of M_4.

Type, female, Joju, Mount Ishizuchi, Iyo, altitude 1,400 meters, July 26, 1952 (*Ishihara*).

This interesting crane-fly was named in honor of the collector, Professor Tamotsu Ishihara, to whom much of our knowledge of the Tipulidæ of Shikoku is due. As indicated in the original description, the most similar species is *Tipula* (*Oreomyza*) *quadrifasciata* Matsumura, which differs in many details of coloration of the body, antennæ and wings.

154. TIPULA (OREOMYZA) LIGULALATA sp. nov. Plate 1, fig. 5; Plate 2, figs. 16, 17.

Allied to *politostriata*; general coloration of thorax gray, the præscutum with three polished black stripes; femora yellow basally, the tips black, on the fore and middle legs involving approximately the outer half; abdomen yellow, the tergites with a narrow brown median vitta, broader and more conspicuous in the famale, the outer segments in male more uniformly blackened; male hypopygium with the median region of tergite produced into a triangular point; inner dististyle with the setæ of the dorsal crest unusually stout, subspinous, outer basal lobe large and conspicuous; eighth sternite bearing a conspicuous ligula on lower surface at base of notch.

Male.—Length, about 11 to 12 millimeters; wing 13 to 14; antenna, about 3.8 to 4.

Female.—Length, about 15 to 16 millimeters; wing, 15 to 16.

Frontal prolongation of head black, sparsely pruinose; nasus distinct; palpi black. Antennæ with the proximal three segments yellow, the outer segments black, with a dense pale pubescence, the small basal enlargements a trifle darker; longest verticils subequal to the segments. Head light gray with a capillary darker median line; no vertical tubercle.

Pronotal scutum dark gray, the scutellum yellow. Mesonotal præscutum gray with three polished black stripes, the broad median one divided behind for more than one-half the length; lateral stripes narrower; scutum gray, the centers of the lobes more polished black; posterior sclerites of notum dark gray, the mediotergite with a capillary blackened central line; pleurotergite more blackened above, the katapleurotergite gray. Pleura dark gray, vaguely patterned with darker on the anepisternum and sternopleurite; dorsopleural region buffy yellow. Halteres obscure yellow, the knobs weakly darkened. Legs with the coxæ pale gray, yellowed near tips; trochanters yellow; femora yellow basally, the tips black, on the fore and middle legs including approximately the outer half, on the posterior legs about the distal third; tibiæ and tarsi black; claws (male) toothed. Wings (Plate 1, fig. 5) obscure yellow, the prearcular and costal fields more brownish yellow; stigma and a seam over the cord brown, the latter narrowed and interrupted at and near M; paler brown clouds in cells R, M, and the anals; wing apex very narrowly darkened; veins black, yellow in the brightened fields. Venation: R_{1+2} entire; cell 1st M_2 small, pentagonal; cell M_1 about twice its petiole.

Abdomen yellow, the basal tergites with a narrow brown median vitta and less evident lateral ones; sixth and succeeding segments in male black. In the female, the median tergal stripe is more broadly indicated; segment seven and parts of adjoining segments black to form a narrow ring; genital shield yellow; cerci long and slender, straight. Male hypopygium (Plate 2, figs. 16, 17) with the tergite, *9t*, transverse, the posterior portion produced medially into a triangular plate which is farther extended into a narrow black compressed blade, the surface with microscopic setulæ. Outer dististyle, *d*, triangular in outline. Inner dististyle with the setæ of the dorsal crest unusually stout, subspinous; outer basal lobe large and conspicuous, bilobed, the surface with several strong setæ, the posterior margin produced into a strong point or tooth; margin of style opposite the sensory area likewise bearing a strong point. Gonapophysis, *g*, bispinous, the two spines slightly unequal in size, divergent. Eighth sternite, *8s*, large and sheathing, the posterior margin bilobed, the base of the notch with a curved flattened ligulate median lobe, directed ventrad and thence caudad; apices of lobes with very long coarse yellow setæ, with a further concentration of somewhat shorter setæ at the midregion; sternite black, the apices of the lobes and the median ligula more yellowed.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Ishizuchi, summit, altitude 1,981 meters, July 27, 1952 (*Ishihara*). Allotopotype, female. Paratopotypes, 1 male, 1 female.

The most similar described species is *Tipula* (*Oreomyza*) *politostriata* Alexander, of the high mountains of Honshu, which differs especially in the details of structure of the male hypopygium, particularly the inner dististyle and eighth sternite.

155. **TIPULA (OREOMYZA) MELANONOTALIS** sp. nov. Plate 1, fig. 6; Plate 2, fig. 18.

Mesonotal præscutum and scutal lobes polished black; head, posterior sclerites of mesonotum and pleura gray; halteres yellow, knob infuscated; femora yellow, the tips black, most extensively so on the fore legs; wings yellow, extensively patterned with pale brown, the prearcular and costal fields brighter yellow; basal abdominal segments yellow, the tergites striped with darker, the outer segments uniformly blackened; male hypopygium with the posterior border of the tergite deeply notched, with a small tooth at base of the emargination; posterior crest of inner dististyle membranous, serrate; gonapophysis with a single blackened spine; eighth sternite moderately produced.

Male.—Length, about 10.5 millimeters; wing, 12.5; antenna, 3.8 to 3.9.

Frontal prolongation of head dark brown, gray pruinose, especially above; nasus elongate; palpi brownish black. Antennæ relatively short, as shown by the measurements; scape and pedicel yellow, first flagellar segment yellowish brown, remaining segments black; basal enlargements of flagellar segments moderately developed, slightly darker; segments subequal to or a trifle shorter than the longest verticils. Head dark gray, the posterior vertex with a broad brown central stripe that widens behind; vertical tubercle low and simple.

Pronotal scutum dark gray, the scutellum paler. Mesonotal præscutum and the scutal lobes polished black, the median region of the scutum and the posterior sclerites of the notum dark plumbeous gray; mediotergite with a capillary darkened median vitta and shorter nearly lateral ones. Pleura and pleurotergite gray, the anapleurotergite and ventral sternopleurotergite slightly darker; dorsopleural region pale yellow. Halteres yellow, the knob infuscated. Legs with the coxæ gray, the fore pair more blackened; trochanters yellow; femora yellow, the tips black, most extensive on the fore legs where about the outer third is included, narrowest on the posterior pair where about the apical fifth is blackened; remainder of legs black, the tibial bases brownish yellow; claws (male) toothed. Wings (Plate 1, fig. 6) brownish yellow, extensively patterned with pale brown, greatly restricting the ground, the latter most evident at the basal fourth of wing, before the cord, near bases of cells R_3 and R_5, cell Cu, and as areas in the anal cells; stigma dark brown; cord with a narrow darker crossband; prearcular and costal fields brighter yellow. No squamal setæ. Venation: Rs about two and one-half times m-cu; R_{1+2} preserved; cell 1st M_2 small, pentagonal, m being the shortest element; cell M_1 about three times its petiole.

Basal abdominal segments yellow, the outer ones blackened, the styli of the hypopygium more obscure yellow; a narrow lateral darkening on basal segments; basal tergites with a slightly broader central stripe that is narrowly interrupted at the incisures. Male hypopygium (Plate 2, fig. 18) with the ninth tergite, *9t*, transverse, the posterior border deeply notched medially, with a small tooth at base of the emargination; inner lobes rounded, heavily blackened, the surface weakly scabrous; more laterad on posterior border with a small point or knob. Outer dististyle, *d*, narrowed outwardly, the setæ of the outer surface unusually long. Inner dististyle with the beak and lower beak blackened, the latter obtusely rounded at apex; posterior crest membranous, pale and low, conspicuously toothed or serrate; outer basal lobe a strong blackened rod, its margin with a few powerful setæ; sensory area at base of this lobe. Gonapophysis, *g*, appearing as a single powerful blackened hook. Ædeagus, *a*, dilated at apex before tip produced into a slender spine. Eighth sternite, *8s*, moderately produced and sheathing, the membranous median area slightly more extended, with relatively short setæ; bristles subtending the central lobe long and powerful, the area at their bases more or less swollen.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Ishizuchi, summit, altitude 1,981 meters, July 27, 1952 (*Ishihara*). Paratopotype, male.

In its general appearance, particularly the polished black præscutum, the present fly suggests *Tipula* (*Trichotipula*) *politonigra* Alexander, which is well-distinguished by the subgeneric characters. From other regional species of *Oreomyza* it is readily told by the coloration and by all details of structure of the male hypopygium.

156. **TIPULA (OREOMYZA) YUSOU** Alexander.

Tipula yusou ALEXANDER, Can. Ent. 46 (1914) 240–241, *pl. 16, fig. 1* (wing), *pl. 19, fig. 1* (♂ hypopygium).

Tipula (*Oreomyza*) *yusou* ALEXANDER, Philip. Jour. Sci. 57 (1935) 123.

TOSA: Imanoyama, altitude 865 meters, May 12, 1951 (*Issiki-Ito*).

A male specimen is the smallest individual of this species that I have yet seen but appears to be conspecific (Length, about 14 millimeters; wing, 16.5). Prearcular and costal fields strongly yellowed, including the veins, and the dark pattern in cells R and M basad of the cord very reduced, appearing chiefly as a small cloud at origin of Rs. I have seen still other specimens that have the darkened pattern only slightly less reduced and believe that the determination is correct.

157. **TIPULA (LUNATIPULA) MANCA** Alexander.

Tipula manca ALEXANDER, Ann. and Mag. Nat. Hist. (9) 14 (1924) 457–458.

Tipula plagiotoma ALEXANDER, Ann. and Mag. Nat. Hist. (9) 14 (1924) 458–459.

Tipula (*Lunatipula*) *manca* ALEXANDER, Philip. Jour. Sci. 57 (1935) 131.

Tipula (*Lunatipula*) *plagiotoma* ALEXANDER, Philip. Jour. Sci. 57 (1935) 131.

IYO: Matsuyama, May 1 to 16, 1948, May 11, 1949 (*Yano*), Dogo, Matsuyama, April 27, 1947 (*Yano*).

158. **TIPULA YANOANA** Alexander. Plate 1, fig. 7; Plate 2, fig. 19.

Tipula yanoana ALEXANDER, in press.

General coloration light gray, the mesonotum with a nearly continuous darkened median stripe, narrowest on the præscutum, widened posteriorly; halteres yellow; legs black, the femoral bases broadly yellow; claws simple; wings yellow, particularly the prearcular and costal fields, the cells beyond the cord darker; stigma dark brown; tip of vein R_{1+2} atrophied; cell 1st M_2 elongate; male hypopygium with the tergite emarginate; outer dististyle elongate; inner dististyle unusually simple, the beak slender, the outer basal lobe produced caudad into a pale horn; ædeagus short and stout, subtended by setiferous lobes.

Male.—Length, about 13 millimeters; wing, 16.5; antenna about 5.

Wings (Plate 1, fig. 7) with the cells before cord brownish yellow, the prearcular and costal fields clear light yellow; cells beyond cord more infuscated; stigma dark brown; broad brown seams on m-cu and distal section of Cu; vague darkenings along vein Cu in cell M and over the anal veins; a prestigmal obliterative spot; obliterative band at cord extending from cell R into base of M_3, involving more than one-half of cell 1st M_2; veins brown, yellow in the brightened fields. No squamal trichia. Venation: R_{1+2} chiefly atrophied, the basal spur subequal to vein R_2 or a little longer; Rs a little less than m-cu; cell 1st M_2 long, narrowed outwardly; petiole of cell M_1 subequal to m; m-cu relatively long, nearly two-thirds the distal section of Cu_1.

Male hypopygium (Plate 2, fig. 19) with the ninth tergite, *9t*, separated from the sternite by a virtually complete suture. Ninth tergite, *9t*, with the posterior border deeply emarginate, the lobes rounded. Outer dististyle, *d*, elongate, approximately five or six times as long as its greatest diameter. Inner dististyle unusually simple, the main body slender, extended into a beak, the posterior end drawn out into a cone-shaped pale horn, representing the outer basal lobe. Ædeagus, *a*, short and stout, black, subtended basally by flattened setiferous lobes.

Type, male Omogokei, Iyo, altitude 700 meters, May 11, 1952 (*Ishihara*).

The species was dedicated to Mr. Toshiro Yano who has aided most materially in developing our knowledge of the Shikoku Tipulidæ. The subgeneric position is uncertain, in some respects suggesting *Schummelia* Edwards, in others being more like *Oreomyza* Pokorny.

LIMONIINÆ

LIMONIINI

159. LIMONIA (LIMONIA) BASISPINA Alexander.

Limonia basispina ALEXANDER, Philip. Jour. Sci. 24 (1924) 554–555, *pl. 1, fig. 7* (♂ hypopygium).

The types were from various stations in Hokkaido, all taken by Esaki in August and September, 1922. Later recorded from Honshu and what appears to represent the same species occurs in China as far west as Szechwan.

IYO: Omogokei, May 10, 1952 (*Kusunoki*); an unusually large male (wing, 10 millimeters).

160. LIMONIA (LIMONIA) ESAKII (Alexander).

Limnobia esakii ALEXANDER, Insec. Inscit. Menst. 10 (1922) 78–79.

Described from Tattaka, Formosa, taken August 17, 1921, by Esaki. Later discovered at various stations in Honshu.

IYO: Joju, Mount Ishizuchi, altitude 1,400 meters, July 26, 1952 (*Ishihara*); a single female having the femora black, without a subterminal yellow ring. I see no reason to question the identity.

161. **LIMONIA (LIMONIA) MONACANTHA Alexander.**

Limonia monacantha ALEXANDER, Philip. Jour. Sci. 24 (1924) 553–554, *pl. 1, fig. 8* (♂ hypopygium).

The type was from Hokkaido, taken in September, 1922, by Esaki.

IYO: Omogokei, altitude 800 meters, June 18, 1952 (*Ishihara*).

162. **LIMONIA (LIMONIA) OMOGOENSIS sp. nov.** Plate 3, figs. 20, 25.

Size small (wing, male, less than 6 millimeters); general coloration of thorax brown, the pleura conspicuously striped longitudinally with brownish black; legs yellowish brown; wings weakly darkened, the oval stigma darker; Sc_1 ending beyond midlength of Rs; male hypopygium with the ventromesal lobe of basistyle bilobed; dististyle small, unequally trilobed, the rostral prolongation a very long slender spine; mesal-apical lobe of gonapophysis simple.

Male.—Length, about 5 millimeters; wing, 5.5.

Rostrum and palpi black. Antennæ with the scape and pedicel black; flagellum broken. Head gray; anterior vertex very narrow, scarcely as wide as a single ommatidium, the latter large.

Pronotum light brown. Mesonotal præscutum brownish yellow, vaguely patterned with brown ,the median stripe darker in front, the outer stripes far laterad in position; scutum brownish yellow, the median area and center of the scutellum brighter yellow, the sides of the latter infuscated; postnotum yellowish brown. Pleura yellowish brown, paler yellow beneath, with a conspicuous brownish black longitudinal stripe extending from the propleura across the central pleurites to the base of the abdomen. Halteres dark brown, knob more blackened base of stem narrowly yellow. Legs with the coxæ yellow, the extreme bases of the fore pair darkened; trochanters yellow; remainder of legs long, yellowish brown, the outer tarsal segments a little darker. Wings (Plate 3, fig. 20) weakly darkened, the oval stigma darker brown; prearcular field vaguely more yellowed; veins brown, those at base more brightened. Venation: Sc_1 ending about opposite three-fifths the length of the long Rs, Sc_2 a short distance from its tip; free tip of Sc_2 and R_2 in transverse alignment; cell 1st M_2 large, subequal in length to distal section of vein M_{1+2}; m-cu a short distance beyond the fork of M.

Abdomen dark brown, including the hypopygium. Male hypopygium (Plate 3, fig. 25) with the posterior border of the ninth tergite, *9t*, convex, vaguely emarginate medially, with a triangular membranous projection beneath; setæ sparse but strong, forming a submarginal row with about ten setæ to each side. Basistyle, *b*, long, its ventromesal lobe conspicuously and unequally bilobed, the larger lower lobe with the surface microscopically corrugated. Dististyle, *d*, single, small, produced into three unequal lobes, each with relatively few strong setæ; rostral prolongation unusually long and slender, narrowed and curved to the acute tip, the surface, especially the lower margin, with long setæ. Gonapophysis, *g*, with mesal-apical lobe simple, blackened.

Habitat.—Japan (Shikoku).

Holotype, male, Omogokei, altitude 800 meters, July 14, 1952 (*Ishihara*).

Superficially the present fly much resembles *Limonia* (*Limonia*) *machidai* (Alexander), differing in the entirely distinct male hypopygium. This latter structure more suggests species such as *L.* (*L.*) *inelegans* (Alexander) but with all details distinct.

163. LIMONIA (LIMONIA) TANAKAI (Alexander). Plate 3, fig. 26.

Limnobia tanakai ALEXANDER, Ann. Ent. Soc. America 14 (1921) 111–112.

Limonia tanakai ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1515, *fig.*

The types were from Ikaho, Gumma-ken, Honshu, taken July 7, 1920, by Tanaka. Later the species was found at various stations in Honshu.

IYO: Omogokei, June 6, 1952 (*Yano*).

The specimen on hand superficially differs from the types in the narrowly darkened costal border of the wings and thus appears to represent a distinct species. However, the male hypopygium is identical and there can be no question of the specific identity.

Male hypopygium (Plate 3, fig. 26) with the tergite, *9t*, large, gradually narrowed outwardly, the posterior border with a broad emargination, the obtuse lateral lobes glabrous. Basistyle, *b*, conspicuously hairy except on outer face of basal half. Dististyle, *d*, distinctive, blackened, broad at base, constricted at near midlength, the lower or concave edge produced into a flange; surface with numerous setæ, especially at apex. Gonapophysis, *g*, with sparse setulæ, the mesal-apical lobe produced into an exceedingly slender and delicate pale point. Ædeagus, *a*, broad, at apex produced into two recurved spinelike lobes.

164. LIMONIA TRISTINA Alexander. **Plate 3, figs. 21, 27.**

Limonia (*Limonia*) *tristina* ALEXANDER, Philip. Jour. Sci. 42 (1930) 512–513.

The species was described from a unique female taken at Kosugidani, Yakushima, 2,500 feet, April 29, 1929, by Issiki.

IYO: Omogokei, June 6, 1952 (*Yano*).

Although there are slight differences in the venation I believe the present reference is correct and am characterizing one of the specimens as allotype.

Male.—Length, about 8 to 9 millimeters; wing, 8 to 9.5.

Characters generally as in the female. Antennæ relatively elongate, if bent backward extending about to the base of the abdomen; flagellar segments subcylindrical, the longest verticils unilaterally distributed, about one-third to one-half longer than the segments; outer segments more elongate, the terminal one subequal to the penultimate. Anterior vertex relatively broad, about three times the diameter of the scape, dusted with gray.

Wings (Plate 3, fig. 21) with Rs less arcuated than in the type, straight, angulated at origin (the figure is from the type). Male hypopygium (Plate 3, fig. 27) with the tergite, *9t*, large, narrowed outwardly, the apex subtruncate to feebly emarginate; surface with abundant setæ except on cephalic portion, more abundant and concentrated near midline of posterior border. Basistyle, *b*, with the ventromesal lobe low and obtuse, large. Dorsal dististyle a gently curved blackened rod, very gradually narrowed to the acute tip. Ventral dististyle, *d*, about as long, fleshy, narrowed to the obtuse tip, the two rostral spines shortly removed from the apex, long and straight, from small basal tubercles; remaining surface of style with setæ, those of outer surface long and erect. Gonapophysis, *g*, with mesal-apical lobe a long slender black spine. Ædeagus, *a*, broad, four-toothed at apex, one pair of teeth directed ventrad.

Allotype, male, Omogokei, June 6, 1952 (*Yano*).

This species is most nearly related to *Limonia anthracina* (Alexander), from which it differs especially in coloration of the wings and structure of the male hypopygium, especially the two dististyles. From the *Dicranomyia*-like structure of the hypopygium it seems inadvisable to refer the species to the typical subgenus.

165. LIMONIA (DICRANOMYIA) DEPAUPERATA (Alexander).

Dicranomyia depauperata ALEXANDER, Ann. Ent. Soc. America 11 (1918) 444; Ent. Mag. (Kyoto) 3 (1919) 122.

The types were from Kyoto, taken in April, 1914, by Nohira. The species is now known to have a wide range, occurring as far south as Formosa, westward in China to Szechwan. It does not appear to be identical with any of the species in the Western Palæarctic Region.

IYO: Omogokei, altitude 900 meters, May 11, 1952 (*Ishihara*).

166. LIMONIA (DICRANOMYIA) SHINANOENSIS Alexander.

Limonia (*Dicranomyia*) *shinanoensis* ALEXANDER, Philip Jour. Sci. 50 (1933) 137–138, *pl. 1, fig. 6* (venation).

The type, a unique female in alcohol, was from Kumanoyu, Shinano, Honshu, taken July 6, 1931, by Yokouchi.

IYO: Omogokei, altitude 800 meters, June 18, 1952 (*Ishihara*).

An unusually large female (Wing, 9 millimeters), differing from the type in certain details, especially the more conspicuous and abruptly blackened apices of the femora. The second pale costal interspace of the wing is a little narrower than in the type, the third a trifle wider. Venation: Sc longer, Sc_1 ending nearly opposite one-third the length of the longer Rs; m-cu about one-third its length before the fork of M.

167. LIMONIA (GERANOMYIA) GIFUENSIS (Alexander). Plate 3, fig. 29.

Geranomyia (*Geranomyia*) *gifuensis* ALEXANDER, Ann. Ent. Soc. America 14 (1921) 114–115.

The types were from Gifu, Honshu, taken October 10, 1920, by Takeuchi. The species is widespread in Honshu, occurring also in northern Korea.

IYO: Dogo, Matsuyama, April 19, 1952 (*Yano*).

Male hypopygium (Plate 3, fig. 29) with the tergite, *9t*, transverse, the lateral lobes very low, with several unusually long setæ. Basistyle darkened, the vetromesal lobe large, simple. Dorsal dististyle a pale stout rod, beyond midlength curved almost at a right angle, the tip acute, darkened. Ventral dististyle, *d*, large and fleshy, its area exceeding three times that of the basistyle, the prolongation short and stout, the apex obtuse; two rostral spines of moderate length, placed close together, the inner one from a low basal tubercle, the subequal outer spine placed at the extreme base of this tubercle. Gonapophysis, *g*, with mesal-apical lobe pale, its apex oblique, terminating in a point. Ædeagus, *a*, broad.

168. LIMONIA (GERANOMYIA) MULTIPUNCTA (Alexander). Plate 3, fig. 30.

Geranomyia multipuncta ALEXANDER, Insec. Inscit. Menst. 10 (1922) 177–178.

The types were from Gifu, Honshu, taken May 1, 1921, by Takeuchi.

IYO: Dogo, Matsuyama, April 10, 1952 (*Yano*).

Male hypopygium (Plate 3, fig. 30) with the tergite, *9t*, transverse, the lateral lobes relatively low, with setæ of moderate length. Basistyle, *b*, with the ventromesal lobe unusually small. Dorsal dististyle a strongly curved slender sickle, very gradually narrowed to the acute tip. Ventral dististyle, *d*, large and fleshy, its area approximately three times that of the basistyle, the setæ relatively sparse and small; rostral prolongation heavily sclerotized beneath, the caudal portion near base produced into a rounded fleshy lobe; rostral spine apical in position, exceedingly long, single but showing the line of fusion of two formerly existing spines; no differentiated basal tubercle. Gonapophysis, *g*, with mesal-apical lobe broad, terminating in a small point that is directed laterad. Ædeagus, *a*, relatively narrow.

169. LIMNORIMARGA LIMONIOIDES (Alexander). Plate 3, figs. 22, 28.

Orimarga (Limnorimarga) limonioides ALEXANDER, Trans. Roy Ent. Soc. London 95 (1945) 241–242.

The type of this unusually interesting fly was from Ompo, North Korea, taken May 30, 1938, by Yankovsky. At the time of describing the group I indicated that it would probably be necessary to raise *Limnorimarga* to full generic status and the receipt of more material emphasizes such an action.

IYO: Omogokei, June 6, 1952 (*Yano*); altitude 800 meters, July 14, 1952 (*Ishihara*).

Wings (Plate 3, fig. 22) with Sc long, Sc_1 ending opposite the fork of Rs, Sc_2 a short distance from its tip. Macrotrichia of veins of outer half of wing unusually abundant, on the basal half lacking except on veins C and R. Male hypopygium (Plate 3, fig. 28) with the tergite, *9t*, narrowed outwardly with a deep median emargination, the lateral lobes obtusely rounded, glabrous. Gonapophysis, *g*, appearing as an elongate simple rod, its tip obtuse. Ædeagus, *a*, appearing as two fused or very closely approximated rods.

170. ORIMARGA (ORIMARGA) YAKUSHIMANA Alexander.

Orimarga yakushimana ALEXANDER, Philip. Jour. Sci. 42 (1930) 517–518, *pl. 1, fig. 8* (venation).

TOSA: Iwai–Imanoyama, altitude 200 meters, May 13, 1951 (*Issiki–Ito*)

171. HELIUS (HELIUS) BREVIORICORNIS (Alexander).

Rhamphidia brevioricornis ALEXANDER, Trans. Amer. Ent. Soc. 46 (1920) 8–9.

The types were from Meguro, Tokyo, taken in April and May, 1919 by Takahashi.

IYO: Dogo, Matsuyama, May 5, 1952 (*Yano*).

172. ANTOCHA (PROANTOCHA) SERRICAUDA Alexander. Plate 4, fig. 34.

Antocha (*Proantocha*) *serricauda* ALEXANDER, Philip. Jour. Sci. 24 (1924) 563–564, *pl. 2, fig. 9* (♂ hypopygium).

Antocha serricauda ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1519, *fig.*

The types were from various stations in Hokkaido, taken by Esaki and Kuwayama.

IYO: Omogokei, June 6 to July 14, 1952 (*Yano*); altitude 800 meters, July 14, 1952 (*Ishihara*).

The peculiar ovipositor was described in the original diagnosis of the species and is illustrated herewith (Plate 4, fig. 34).

173. ANTOCHA (ANTOCHA) BIDIGITATA sp. nov. Plate 3, fig. 23; Plate 4, fig. 35.

Size relatively large (wing, male, 7 millimeters); general coloration gray, the præscutum with indications of three more brownish stripes; wings with a grayish tinge, the base more whitened; basal section of R_{4+5} long; male hypopygium with the outer dististyle blackened, its tip obtuse; longest pair of gonapophyses divided at apex into two slightly unequal finger-like lobes.

Male.—Length, about 6 millimeters; wing, 7; antenna, about 0.9.

Rostrum gray; palpi black. Antennæ short, dark brown, the pedicel slightly darker; first flagellar segment oval, the succeeding eight or nine segments very short-oval to nearly moniliform, the outer segments more oval; terminal segment about one-half longer than the penultimate. Head brownish gray, the front and narrow orbits clearer gray.

Thorax clear gray, the præscutum with three vague more brownish stripes, the median one broad. Halteres yellow, the knob infuscated. Legs with the coxæ pale, sparsely gray pruinose; trochanters yellow; remainder of legs brown, the outer segments passing into black; claws long and nearly straight, with a conspicuous tooth. Wings (Plate 3, fig. 23) with a grayish tinge, the prearcular field more whitened; veins brown, R_3 paler. Venation: Basal section of R_{4+5} long; nearly equal to R_{2+3}; cell 1st M_2 small; m-cu about one-half its length before the fork of M.

Abdomen dark brown, sparsely pruinose, the subterminal segments slightly darker; hypopygium brownish yellow. Male hypopygium (Plate 4, fig. 35) with the tergite, *9t*, transverse, the posterior border gently emarginate; setæ abundant but not concentrated, occupying about the outer two-thirds of the sclerite. Basistyle, *b*, simple. Dististyles, *d*, slightly subterminal in position; outer style black, gently arcuated, its tip obtuse; on lower margin at near midlength bearing a microscopic denticle; inner style subequal in length, not dilated, narrowed outwardly, the surface with relatively few but strong setæ. Phallosome, *p*, complex, consisting of three pairs of apophyses, the longest pair divided at apex into two slightly unequal pale fingerlike lobes, the other paired apophyses acutely pointed at apices.

Habitat.—Japan (Shikoku).

Holotype, male, Omogokei, May 10, 1952 (*Kusunoki*).

This very distinct fly is most similar to species such as *Antocha* (*Antocha*) *brevinervis* Alexander and *A.* (*A.*) *dilatata* Alexander, differing from all in the structure of the male hypopygium, particularly the phallosome.

174. ANTOCHA (ANTOCHA) GRACILLIMA Alexander. Plate 4, fig. 36.

Antocha (*Antocha*) *gracillima* ALEXANDER, Ann. and Mag. Nat. Hist. (9) 15 (1925) 67–68.

The type was from Mount Wakasugi, Chikuzen, Kyushu, collected April 19, 1924, by H. Hori.

IYO: Omogokei, altitude 800 meters, July 28, 1952 (*Ishihara*).

The male hypopygium was discussed in the original description but has not been figured previously (Plate 4, fig. 36).

175. ANTOCHA (ANTOCHA) SPICATA Alexander.

Antocha (*Antocha*) *spicata* ALEXANDER, Philip. Jour. Sci. 59 (1936) 238–239, *pl. 1, fig. 10* (venation), *pl. 2, fig. 29* (♂ hypopygium).

Described from various stations in Hokkaido, Honshu and Kyushu, the type being from Kibune, Kyoto, taken October 11, 1934, by Tokunaga.

IYO: Omogokei, July 14, 1952 (*Yona*), May 14, 1952 (*Shihara*).

The wings are darker in color than in the types, with darker veins, but from hypopygial characters the identification appears to be correct.

176. DICRANOPTYCHA YAMATA Alexander. Plate 3, fig. 24.

Dicranoptycha yamata ALEXANDER, Ann. Ent. Soc. America 12 (1919) 332–333.

The types, all females, were from Meguro, Tokyo, taken between April 23 and May 5, 1919, by Takahashi.

IYO: Omogokei, May 10, 1952 (*Kusunoki*).

The present material agrees closely with the types except that the median præscutal stripe is divided by a pale ground vitta. The venation is shown (Plate 3, fig. 24).

PEDICIINI

177. PEDICIA (TRICYPHONA) OPTABILIS (Alexander). Plate 4, fig. 32.

Tricyphona optabilis ALEXANDER, Ann. Ent. Soc. America 17 (1924) 70–71.

The type was from Otaki, Chichibu, Saitama, Honshu, taken April 23, 1922, by Machida. Known from various stations in Honshu and Hokkaido.

IYO: Mount Saragamine, altitude 800 meters, April 16, 1952 (*Ishihara*).

The venation of the type is shown (Plate 4, fig. 32). In the present specimen, a male, abnormalities of venation appear in both wings, in the right wing there being an adventitious crossvein in cell R_1 (as in *Dicranota,* s.s.), while in both wings there is a comparable crossvein in cell R_3 opposite or shortly beyond R_2. The darkened wing pattern is slightly heavier than in the type, particularly over the posterior cord.

178. PEDICIA (TRICYPHONA) YAKUSHIMANA (Alexander).

Tricyphona yakushimana ALEXANDER, Philip. Jour. Sci. 42 (1930) 67–68, *pl. 1, fig. 5* (venation), *pl. 2, fig. 27* (♂ hypopygium).

The types were from Kosugidani, Yakushima, altitude 2,500 feet, taken April 29, 1929, by Issiki.

IYO: Mount Saragamine, altitude 900 meters, April 16, 1952 (*Ishihara*); Omogokei, July 14, 1952 (*Yano*).

The female from Omogo has vein R_2 somewhat shorter than normal, subequal to R_{1+2} and with R_{2+3+4} longer, about two-thirds R_{2+3}.

179. HETERANGÆUS GLORIOSUS KUSUNOKII subsp. nov. Plate 4, fig. 31.

Female.—Length, about 15 millimeters; wing, 13.

Characters as in the typical form (North Korea, Karafuto). Mesonotal præscutum gray with four brown stripes, the intermediate pair separated by a capillary ground vitta. Wing pattern differing in details: Basal darkened area extended for some distance into cells R and M; spots in cell Cu sparse and scattered. Venation (Plate 4, fig. 31): Sc_2 long, oblique; m at fork of M_{1+2}.

Holotype, female, Yuyama, near Matsuyama, Iyo, April 15, 1952 (*Kusunoki*).

I am pleased to name this subspecies for the collector, who has secured many interesting Tipulidæ in Iyo Province. Although the fly is very similar to the typical form, I cannot regard the two as being identical. The only other regional member of the genus known at present is *Heterangæus japonicus* (Alexander) which is readily told by the uniformly darkened costal field.

180. DICRANOTA (RHAPHIDOLABIS) CONSORS (Alexander). Plate 4, fig. 37.

Rhaphidolabis consors ALEXANDER, Ann. Ent. Soc. America 16 (1923) 68–69.

The type was from Tamagawa, Saitama, Honshu, taken November 13, 1920, by Machida.

IYO: Omogokei, June 6, 1952 (*Yano*).

Male hypopygium (Plate 4, fig. 37) with the ninth tergite, *9t*, transverse, the median area of the posterior border a little produced, the truncate apex with several long setæ; lateral tergal arms long and slender. Basistyle, *b*, with a group of long setæ on mesal face near base; apical lobe short, with a few spinous setæ. Interbase, *i*, distinctive, narrowed beyond base, thence dilated into a blade, the outer apical angle produced into a short point, the inner apical angle obtusely rounded; face of blade near apex with a small obtuse flange. Dististyles, *d*, two, the outer with abundant spinose setæ; inner style obtuse at apex, the inner margin at base with an extensive setulose area.

181. DICRANOTA (RHAPHIDOLABIS) PERSESSILIS sp. nov. Plate 4, fig. 33.

Size relatively large (wing, female, 8 millimeters or more); general coloration of thorax gray, the præscutum with three entire brown stripes; legs black, the femoral bases obscure brownish yellow; wings subhyaline, the prearcular field more yellowed; cell R_3 sessile.

Female.—Length, about 7.5 to 8 millimeters; wing, 8 to 8.5.

Rostrum dark gray; palpi brownish black. Antennæ 13-segmented, black; flagellar segments oval. Head gray, the center of the vertex more infuscated.

Pronotum gray, darker medially. Thoracic dorsum gray, the præscutum with three entire brown stripes; each scutal lobe with two darkened areas, the more anterior being a posterior extension of the lateral præscutal stripe; posterior sclerites of notum and the pleura clearer gray; dorsopleural membrane buffy yellow. Halteres pale, knob infuscated. Legs with the coxæ gray; trochanters obscure yellow; femora black, the bases obscure brownish yellow, narrowly so on the fore pair, more extensive on the posterior legs, involving about the basal third; remainder of legs black. Wings (Plate 4, fig. 33) subhyaline, the short prearcular field light yellow; stigma oval, pale brown; veins brown, yellow in the prearcular field. Venation: Sc_1 ending about opposite midlength of R_{2+3+4}; R_2 slightly oblique, subequal to or longer than R_{1+2}; cell R_3 short-sessile to more broadly so.

Abdomen dark brown, sparsely pruinose ovipositor reddish horn color.

Habitat.—Japan (Shikoku).

Holotype, female, Mount Saragamine, Iyo, altitude 900 meters, April 16, 1952 (*Ishihara*). Paratopotype, female, altitude 800 meters, April 16, 1952 (*Ishihara*). Paratopotype, female, altitude 800 meters, April 16, 1952 (*Ishihara*).

In its general appearance, this fly is most similar to *Dicranota* (*Rhaphidolabis*) *flavibasis* (Alexander), differing particularly in the sessile cell R_3. The still unknown male should supply further supporting characters.

182. DICRANOTA (RHAPHIDOLABIS) POLYMERA Alexander.

Dicranota (*Rhaphidolabis*) *polymera* ALEXANDER, Philip. Jour. Sci. 51 (1933) 537–538, *pl. 1, fig. 18* (venation), *pl. 3, fig. 39* (♂ hypopygium).

The type male was from Mount Wakasugi, Chikuzen, Kyushu, taken November 15 to 16, 1930, by Esaki. The hitherto unknown female is here characterized as allotype.

Female.—Length, about 9 millimeters; wing, 9.5.

Characters generally as in the type male but larger, as shown by the measurements. Median præscutal stripe entire. Fore femora with about the distal two-thirds brownish black, the bases yellow, the remaining femora with the tips more narrowly darkened, on the posterior pair including about the outer fourth or fifth. Ovipositor with the valves yellowish horn color.

Allotype, female, Sugitate, Iyo, March 30, 1952 (*Fumihiko Takechi*).

HEXATOMINI

183. AUSTROLIMNOPHILA (AUSTROLIMNOPHILA) HORII (Alexander).

Pseudolimnophila horii ALEXANDER, Ann. and Mag. Nat. Hist. (9) 15 (1925) 391.

Originally described from Kyushu.

AWA: Mount Tsurugi, altitude 1,400 meters, May 30 to 31, 1950 (*Issiki-Ito*).

IYO: Mount Ishizuchi, altitude 1,400 to 1,981 meters, June 9, 1950 (*Issiki-Ito*).

There is a somewhat noteworthy range in venation shown in the present series, especially as regards the length and degree of elevation of vein R_{2+3+4}; in some specimens this is shorter than m-cu and almost straight, while at the opposite extreme it is about one-half longer than m-cu and strongly arcuated. There is also some variation in the relative proportions of cell 1st M_2. It seems certain that a single species is involved.

184. DACTYLOLABIS (DACTYLOLABIS) DILUTA Alexander. Plate 4, fig. 38.

Dactylolabis diluta ALEXANDER, Insec. Inscit. Menst. 10 (1922) 183.

The type, a unique male, was from Gifu, Honshu, taken April 20, 1921, by Takeuchi.

IYO: Omogokei, altitude 700 to 800 meters, May 10 to 12, 1952 (*Ishihara*).

Male hypopygium (Plate 4, fig. 38) with the posterior border of tergite, *9t*, narrowly and deeply split medially. Dististyles, *d*, unusually slender, subequal in length, the outer one with long conspicuous setæ, the inner style with microscopic punctures. Ædeagus, *a*, small, subtended by long-oval apophyses that are produced cephalad into long straight rods.

185. DACTYLOLABIS (DACTYLOLABIS) LONGICAUDA Alexander.

Dactylolabis longicauda ALEXANDER, Insec. Inscit. Menst. 10 (1922) 184–185.

AWA: Mount Tsurugi, Minokosi, altitude 1,400 meters, to Nagoro, altitude 900 meters, June 1, 1950 (*Issiki-Ito*).

IYO: Mount Ishizuchi, Koguti, altitude 300 meters, to Ishizuchi at 1,400 meters, June 8, 1950 (*Issiki-Ito*).

TOSA: Nisigawa, near Yanase, altitude 800 meters, May 3, 1951 (*Issiki-Ito*).

186. LIMNOPHILA (ADELPHOMYIA) ACICULARIS sp. nov. Plate 5, figs. 42, 47.

General coloration dark plumbeous gray; halteres whitened; legs obscure yellow, the tips of the tibiæ and basitarsi very narrowly darkened; wings weakly tinged with brown, with a restricted brown pattern; male hypopygium with the tergite narrowed outwardly, the posterior border produced into two narrow parallel lobes; gonapophyses very long, simple, acicular, strongly narrowed to the acute tips, slightly exceeding the ædeagus.

Male.—Length, about 5.2 to 5.5 millimeters; wing, 6.3 to 6.5; antenna, about 1.5.

Female.—Length, about 6.8 millimeters; wing, 6.5.

Rostrum and palpi black. Antennæ (male) moderately long, if bent backward extending about to the base of abdomen, pale brown, the scape darker; flagellar segments long-oval, subequal to the verticils. Head dark gray.

Thorax almost uniformly dark plumbeous gray, the præscutum with a pair of intermediate brown stripes, evident on the anterior half. Halteres whitened. Legs with the coxæ and trochanters light yellow; remainder of legs obscure yellow, the tips of the tibiæ and basitarsi very narrowly darkened, the remainder of tarsi black. Wings (Plate 5, fig. 42) with a weak brownish tinge, the prearcular field more yellowed; a restricted but evident brown pattern, including seams at origin of Rs, Sc_2, cord and outer end of cell 1st M_2, fork of R_{2+3+4} and the stigma; veins of outer half of wing brown, of the proximal half more yellowed, especially Sc and Cu. Macrotrichia in outer ends of cells R_2 to M_4 (shown in figure by stippling). Venation: Sc_1 ending a short distance before fork of Rs, Sc_2 a short distance from its tip; R_{2+3+4} varying from subequal to about twice the basal section of R_5; inner ends of cells R_3, R_5 and 1st M_2 in oblique alignment, with the first most distad; cell M_1 a little longer than its petiole; m-cu from two-thirds to nearly its own length beyond the fork of M.

Abdominal tergites brown, the basal sternites more brightened; hypopygium yellow. In the female, posterior borders of the sternites narrowly pale. Male hypopygium (Plate 5, fig. 47) with the tergite, *9t*, narrowed outwardly, its posterior border produced into two narrow parallel lobes that are separated by a slightly wider notch. Outer dististyle, *d*, parallel-sided, with two apical teeth. Inner dististyle with its lower branch slender. Gonapophysis, *g*, very long, simple, acicular, strongly sinuous, narrowed to the acute tip, slighty exceeding the ædeagus in length, the latter with a membranous sheath on more than the basal half.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Tsurugi, Awa, Minokosi, altitude 1,400 meters, to Nagoro, altitude 900 meters, June 1, 1950 (*Issiki-Ito*). Allotype, female, Nisigawa to Kokusen, near Yanase, Tosa, altitude 600 meters (*Issiki-Ito*). Paratypes, male Imanoyama, Tosa, altitude 865 meters, May 12, 1951 (*Issiki-Ito*) male, Minokosi, Mount Tsurugi, altitude 1,400 meters, June 1, 1950 (*Issiki-Ito*); male and female, with the allotype.

The species is readily told from the other dark colored members of the subgenus, such as *Limnophila* (*Adelphomyia*) *pilifer* Alexander by the structure of the male hypopygium, particularly the tergite and gonapophysis.

187. LIMNOPHILA (ADELPHOMYIA) BIACUS sp. nov. Plate 5, figs. 43, 48.

General coloration yellow; male hypopygium with the posterior border of the tergite produced into two oval lobes; gonapophysis appearing as a very long acicular rod that splits at about three-fourths the length into two needlelike spines.

Male.—Length, about 5.5 millimeters; wing, 6; antenna, about 1.4.

Female.—Length, about 6 millimeters; wing, 6.5.

Rostrum yellow; palpi slightly darker. Antennæ with basal segments yellow, the outer flagellar segments darker, with conspicuous outspreading setæ, additional to the still longer verticils. Head yellow.

Thorax uniformly light yellow. Halteres yellow. Legs obscure yellow, the surface appearing somewhat darker because of abundant dark colored setæ. Wings (Plate 5, fig. 43) uniformly yellow, the veins darker. Abundant macrotrichia in cells beyond cord, from R_1 to M_4, inclusive (shown in figure by stippling). Venation: Cell M_1 about one-half longer than its petiole; m-cu approximately one-half its length beyond the fork of M.

Abdomen uniformly yellow. Male hypopygium (Plate 5, fig. 48) with the posterior border of the ninth tergite, *9t*, produced into two oval lobes with obtusely rounded tips, separated by a deep and narrow V-shaped notch. Dististyles, *d*, unusually long and slender, particularly the outer style which is approximately eight or nine times as long as the diameter at midlength; apex darkened, terminating in the usual two teeth, the axial one stouter and more decurved, the lateral spine slender, acute; at base of style on inner margin with a squarish subhyaline flange or lobe; inner style about three-fourths as long, gently clavate, at near midlength on the lower margin produced into a flange that is farther produced into a small lobe. Gonapophysis, *g*, distinctive, appearing as a very long slender acicular rod that divides at about three-fourths the length into two appressed needlelike spines, the outer one a trifle longer and more slender. Ædeagus, *a*, long and sinuous, before the tip produced into a pale flange.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Ishizuchi, Iyo, altitude 1,400 meters, June 10, 1950 (*Issiki-Ito*). Allotype, female, Omogokei, Iyo, June 6, 1952 (*Yano*). Paratopotype, one male, with the holotype.

In its yellow body coloration, this species is most similar to *Limnophila* (*Adelphomyia*) *flavella* Alexander, differing from this and all other known species by the very distinct male hypopygium, particularly the deeply bifid gonapophyses.

188. LIMNOPHILA (ADELPHOMYIA) BREVIRAMA Alexander.

Limnophila (*Lasiomastix*) *breviramus* ALEXANDER, Ann. and Mag. Nat. Hist. (9) 15 (1925) 71–72.

AWA: Mount Tsurugi, Minokosi, altitude 1,400 meters, to Nagoro, altitude 900 meters, June 1, 1950 (*Issiki-Ito*).

IYO: Mount Ishizuchi, altitude 1,400 to 1,981 meters, June 9, 1950 (*Issiki-Ito*).

189. LIMNOPHILA (ADELPHOMYIA) CÆSIELLA Alexander.

Limnophila (*Tricholimnophila*) *cæsiella* ALEXANDER, Philip. Jour. Sci. 40 (1929) 538.

The types were from near Fukuoka, Kyushu, taken April 5 to 13, 1924, by H. Hori. The later described *satsumicola* Alexander (1930) is very close and may prove not to be distinct.

IYO: Omogokei, altitude 800 meters, May 10, 1952 (*Edashige*); Mount Saragamine, altitude 800 meters, April 16, 1952 (*Ishihara*).

190. LIMNOPHILA (PRIONOLABIS) ACUTISTYLUS Alexander. Plate 4, fig. 39.

Limnophila (*Prionolabis*) *acutistylus* ALEXANDER, Ann. and Mag. Nat. Hist. (9) 15 (1925) 389.

The types were from Mount Wakasugi, Chikuzen, Kyushu, altitude 2,530 feet, taken April 19, 1924, by H. Hori.

IYO: Tagamisan, near Matsuyama, April 5, 1952 (*Kusunoki*); Mount Takanawa, March 28, 1952 (*Kusunoki*); Mount Saragamine, altitude 800 meters, April 16, 1952 (*Ishihara*).

Male hypopygium (Plate 4, fig. 39) with the inner dististyle, *d*, acute at tip. Ninth tergite with the median region of the posterior border very slightly emarginate to subtransverse.

191. LIMNOPHILA (PRIONOLABIS) UNCINATA sp. nov. Plate 4, fig. 40; Plate 5, fig. 41.

Size medium (wing, male, about 11 millimeters); general coloration black, sparsely pruinose; antennæ 16-segmented; legs black, the femoral bases yellow, narrowest on the fore legs; wings brownish yellow, restrictedly patterned with brown; male hypopygium with the posterior border of the tergite conspicuously emarginate, with a slender lobe at either end of the notch; outer dististyle with a single lateral tooth; inner dististyle terminating in a long slender spine; gonapophysis unusually slender.

Male.—Length, about 9.5 to 10 millimeters; wing, 11 to 11.5.

Rostrum and palpi black. Antennæ 16-segmented, black; terminal segment long, approximately one-fourth longer than the penultimate; lower faces of the more proximal flagellar segments slightly produced. Head black, sparsely pruinose.

Thorax black, sparsely pruinose. Halteres yellow. Legs with the coxæ gray pruinose; trochanters black; remainder of legs black, the femoral bases yellow, narrowest on the fore legs where about one-third is included, broadest on the posterior femora where approximately three-fourths is brightened. Wings (Plate 5, fig. 41) brownish yellow, the prearcular and costal fields somewhat brighter yellow; stigma dark brown; narrow and inconspicuous brown seams at origin of Rs, over the cord and outer end of cell 1st M_2; veins dark brown, yellow in the more brightened fields. Venation: R_{2+3+4} very short, less than one-half the basal section of R_5; cell M_1 a trifle longer than its petiole; m-cu at near midlength of cell 1st M_2.

Abdomen, including hypopygium, black, the surface sparsely pruinose. Male hypopygium (Plate 4, fig. 40) with the caudal margin of the tergite with a conspicuous rounded notch, the lateral ends of which are produced into conspicuous lobes. Outer dististyle, *d*, with a single powerful lateral tooth; inner style terminating in a long slender spine, with a stouter lateral branch that is truncated at its tip. Gonapophysis, *g*, yellow, unusually slender, narrowed gradually to the tip.

Habitat.—Japan (Shikoku).

Holotype, male, Omogokei, altitude 700 meters, May 12, 1952 (*Ishihara*). Paratopotype, male, pinned with type.

The most similar species appear to be *Limnophila* (*Prionolabis*) *nigrofemorata* Alexander and *L.* (*P.*) *rufipennis* Alexander, which differ in the details of the male hypopygium, particularly the inner dististyle.

192. ELEPHANTOMYIA (ELEPHANTOMYIA) DIETZIANA Alexander. Plate 5, fig. 49.

Elephantomyia (*Elephantomyia*) *dietziana* ALEXANDER, Philip. Jour. Sci. 42 (1930) 526–528.

Elephantomyia (*Elephantomyia*) *dietziana* ITO, Mushi 18, pars 14 (1948) 90, *fig. 2A* (♂ hypopygium).

AWA: Mount Tsurugi, Minokosi to summit, altitude 1,400 to 1,955 meters, May 31 to June 1, 1950; Sugeoi, June 4, 1950 (*Issiki-Ito*).

TOSA: Nisigawa to Kokusen, near Yanase, altitude 600 meters, May 4, 1951; Mount Imanoyama, altitude 200 to 865 meters, May 12, 1951 (*Issiki-Iito*).

The species varies greatly in size and instensity of coloration, yet from the structure of the male hypopygium seems to be divisable only into the subspecies described next.

Male hypopygium (Plate 5, fig. 49) with the caudal border of the tergite, *9t*, moderately convex. Basistyle with the setæ of mesal face unusually long. Dististyle, *d*, terminal in position, the outer style with the axial tooth strongly curved, the subterminal one shorter and weaker; inner dististyle a broadly flattened blade, near its apex with two strong setæ, with a third similar bristle on outer margin at near two-thirds the length; base of style tumid, with abundant strong setæ. Gonapophysis, *g*, with the apical point or blade long and slender, diaphanous; spines of outer margin about 8 to 10 in number, the outer ones smaller and more appressed. Ædeagus, *a*, with the penefilum broad and flattened, ribbonlike, gradually narrowed outwardly.

192a. ELEPHANTOMYIA (ELEPHANTOMYIA) DIETZIANA PLUMBEA subsp. nov.

Female.—Length, excluding rostrum, about 8.5 millimeters; wing, 9; rostrum, about 6.

Generally as in typical *dietziana*, differing chiefly in the plumbeous gray color of the thorax. In the type female, the entire thorax, including the scutellum, is dark gray, much darker than the light gray head. Fore femora with about the proximal third yellowed, the remainder black; middle and hind femora yellow, the tips blackened, on the posterior pair including about the outer sixth; tibiæ brown, the tips extensively black; tarsi black. Wings with the stigma elongate, brown, unusually distinct. Abdominal tergites dark brown, sparsely pruinose, the pleural membrane narrowly yellow; sternites similarly darkened, five to seven each with a large yellow mark on the disk.

In the remainder of the type series referred to this subspecies, the thoracic coloration is not as clear gray and the scutellum and adjoining regions are more yellowed. Abdominal pattern more as in typical *dietziana*, with the tergites conspicuously yellow basally the amount more extensive than on the sternites where the color is restricted to the basal third.

Habitat.—Japan (Shikoku).

Holotype, female, Mount Tsurugi, Awa, Minokosi, altitude 1,400 meters, to Nagoro, altitude 900 meters, June 1, 1950

(*Issiki-Ito*). Allotopotype, male, with the type. Paratypes, males and females, Imanoyama, Tosa, altitude 865 meters, May 12, 1951 (*Issiki-Ito*).

193. ELEPHANTOMYIA (ELEPHANTHOMYIA) SUBTERMINALIS sp. nov. Plate 5, figs. 44, 50.

Thorax yellow, unpatterned; head gray; rostrum brownish black, nearly as long as remainder of body; halteres yellow; femora light brown, the tips narrowly more darkened; wings brownish yellow, the stigma a trifle darker, ill-defined; Rs square and weakly spurred at origin; abdomen brownish yellow, the posterior borders of the tergites narrowly dark brown, forming a narrow subterminal ring on the eighth segment; male hypopygium with the dististyles subterminal in position, the basistyle narrowed outwardly; gonapophysis terminating in a diaphanous blade that is surrounded by four or five appressed darker spines.

Male.—Length, excluding rostrum, 6 to 6.2 millimeters; wing, 7 to 7.2; rostrum, about 5.5 to 6.

Female.—Length, excluding rostrum, 7 to 8 millimeters; wing 7.5 to 8.5; rostrum, about 5.5 to 6.

Rostrum brownish black, nearly as long as the remainder of body. Antennæ brownish yellow to light brown; flagellar segments long-cylindrical, the outer verticils very long, much exceeding the segments. Head gray; anterior vertex narrow, less than the diameter of scape.

Pronotum pale yellow, the mesonotum and pleura deeper yellow, without pattern. Halteres yellow. Legs with the coxæ and trochanters light yellow; femora yellowish brown to light brown, the tips narrowly more darkened; tibiæ and tarsi pale brown; tibial spurs distinct. Wings (Plate 5, fig. 44) brownish yellow, the base somewhat clearer yellow; stigma a trifle darker than the ground, ill-defined; veins brown, paler in the prearcular and costal regions. Venation: Sc_2 ending distinctly before the fork of Rs, the latter square and weakly spurred at origin; branches of Rs generally parallel to one another throughout their length; m-cu at or shortly before midlength of cell 1st M_2.

Abdomen brownish yellow, the posterior borders of the tergites narrowly dark brown, gradually increasing in amount on outer segments, forming a narrow subterminal ring involving segment eight and the outer half of segment seven; hypopygium yellow. Male hypopygium (Plate 5, fig. 50) with the tergite subtruncate or scarcely produced. Basistyle, *b*, strongly narrowed outwardly, the dististyle, *d*, subterminal in position; cephalic-mesal part of style with a concentration of setæ.

Phallosome consisting of a moderately developed stout penefilum and distinctive gonapophyses, *g*, each of the latter terminating in a diaphanous blade, surrounded by four or five darker spines, these strongly appressed at the apex of the apophysis and directed outwardly.

Habitat.—Japan (Shikoku).

Holotype, male, Mount Tsurugi, Awa, Minokosi, altitude 1,400 meters, to Nagoro, altitude 900 meters, June 1, 1950 (*Issiki-Ito*). Allotype, female, Totidani, near Yanase, Tosa, altitude 400 meters, May 2, 1951 (*Issiki-Ito*). Paratopotypes, 1 male, 1 female, altitude 1,400 to 1,955 meters, May 31, to June 1, 1950; paratypes, males and females, with the allotype.

This species is readily distinguished from *Elephantomyia (Elephantomyia) dietziana* Alexander by the body coloration and by the structure of the male hypopygium, particularly the subterminal dististyles and the armature of the gonapophyses. The Western Palæartic *E.* (*E.*) *edwardsi* Lackschewitz likewise has subterminal dististyles but in all other respects is a very different fly.

194. ELEPHANTOMYIA (ELEPHANTOMYIA) TETRACANTHA sp. nov. Plate 5, fig. 51.

General coloration of thorax reddish brown, sparsely pruinose; head gray; rostrum brownish black, relatively short, approximately two-thirds the body; femora yellow, the tips rather narrowly and abruptly blackened; wings yellow, stigma long-oval, pale brown; abdomen yellow, the tergites with a ⊥-shaped area, the sternites with the posterior third narrowly darkened, the eighth segment black to form a narrow ring; male hypopygium with the posterior border of the tergite produced into a broad rounded lobe; dististyles terminal; gonapophysis very large, produced into four strong spinous blades; ædeagus appearing to have no penefilum.

Male.—Length, excluding rostrum, about 7.5 millimeters; wing, 8; rostrum, about 5.

Rostrum relatively short, approximately two-thirds the body, brownish black throughout. Head above light gray; anterior vertex relatively narrow, subequal to the diameter of the scape.

Pronotum yellow. Mesothorax chiefly reddish brown, sparsely pruinose in the unique type, the anterior two-thirds of the præscutum more yellowed, apparently an abnormal condition. Halteres yellow. Legs with the coxæ reddish; trochanters yellow; femora yellow, the tips abruptly blackened, involving about the outer fifth or sixth; tibiæ yellow, the tips more narrowly darkened; tarsi brown; tibial spurs distinct. Wings yellow, the prearcular and costal fields clearer yellow; stigma long-oval, pale brown; veins brown, yellow in the more brightened fields. Venation: Rs longer than cell 1st M_2, angularly bent at origin; m-cu close to midlength of cell 1st M_2.

Abdomen yellow, the tergites with a ⊥-shaped darkened area, the sternites with the posterior border narrowly darkened; eighth segment black, forming a narrow ring; hypopygium yellow. Male hypopygium (Plate 5, fig. 51) with the posterior border of the tergite, *9t*, produced into a broad low median lobe, its outline nearly a semicircle, provided with abundant setæ. Basistyle, *b*, with the setæ of mesal face abundant and well-distributed over the entire surface. Dististyles, *d*, terminal; outer style slender, the curved axial spine only a little stouter than the straight subapical one; inner style longer, nearly straight, narrowed to the blunt tip, the outer half with conspicuous setæ. Gonapophysis, *g*, distinctive, very large, extended into four blades or flattened spines, as shown. Ædeagus, *a*, slender, narrowed outwardly, the apex pale, diaphanous, not produced into a long penefilum as common in the genus; it does not appear that the organ in the unique type is broken.

Habitat.—Japan (Shikoku).

Holotype, males, Mount Tsurugi, Awa, altitude 1,400 to 1,955 meters, May 31, 1950 (*Issiki-Ito*).

By Ito's key to the Japanese and Formosan species of *Elephantomyia* [Mushi (14) 18 (1948) 89–90], the present fly runs to *Elephantomyia* (*Elephantomyia*) *takachihoi* Ito, which is a larger species with the male hypopygium quite distinct, having simple pointed gonapophyses, somewhat as in *E.* (*E.*) *hokkaidensis* Alexander. The structure of the gonapophyses of the present fly will readily separate it from all other generally similar regional species.

ERIOPTERINI

195. LIPSOTHRIX YAMAMOTANA OMOGOENSIS subsp. nov.

Female.—Length, about 8 millimeters; wing, 8.

Characters as in the typical form (Iwate, Honshu), differing as follows: Femora yellow, the tips narrowly and abruptly black, only a trifle more extensive on the fore pair, including about the outer seventh; tibiæ light yellow, the tips narrowly blackened, the amount less than on the femora. Wings with the ground clear pale yellow, a little more grayish beyond cord; no dusky seam along vein Cu in cell M; veins before cord yellow, beyond the cord darker. Venation: Cell 1st M_2 longer, approximately twice the width, with m-cu about one-third to one-fourth its length beyond fork.

Habitat.—Japan (Shikoku).

Holotype, female, Omogokei, altitude 700 meters, May 11, 1952 (*Ishihara*).

196. RHABDOMASTIX (SACANDAGA) JAPONICA Alexander. **Plate 5, fig. 45.**

Rhabdomastix (*Sacandaga*) *japonica* ALEXANDER, Ann. Ent. Soc. America 17 (1924) 69–70.

The unique type was taken near Tokyo on May 24, 1922, by Esaki.

IYO: Matsuyama, May 2, 1952 (*Ishihara*).

The wing is shown (Plate 5, fig. 45).

197. GONOMYIA (LIPOPHLEPS) QUADRIFILA Alexander.

Gonomyia (*Lipophleps*) *quadrifila* ALEXANDER, Philip. Jour. Sci. 42 (1930) 530–531, *pl. 1, fig. 18* (venation), *pl. 2, fig. 31* (♂ hypopygium).

The type was from Yasakagawa, Oita-ken, Kyushu, taken May 10, 1929, by Tenji Uye.

IYO: Dogo, Matsuyama, May 18, 1952 (*Yano*). The single female specimen appears to be correctly referred to this species.

198. GONOMYIA (LIPOPHLEPS) SAUTERI Alexander.

Gonomyia (*Lipophleps*) *sauteri* ALEXANDER, Philip. Jour. Sci. 43 (1930) 525–526, *pl. 1, fig. 16* (venation), *pl. 3, fig. 41* (♂ hypopygium).

The type was from Daitotei, Formosa, taken in April, 1914, by Sauter. The fly also occurs in China as far west as Szechwan and is evidently a wide-spread species.

IYO: Dogo, Matsuyama, April 27, 1952 (*Yano*). Although only a single female specimen is available I can see no reason to question the determination.

199. GONOMYIA (GONOMYIA) NANSEI Alexander.

Gonomyia (*Gonomyia*) *nansei* ALEXANDER, Philip. Jour. Sci. 43 (1930) 524–525, *pl. 1, fig. 15* (venation), *pl. 3, fig. 40* (♂ hypopygium).

The types were from Hassensan, Formosa, taken at altitudes between 2,500 and 5,600 feet in August and October, 1929, by Issiki.

IYO: Dogo, Matsuyama, April 19, 1952 (*Yano*).

I can see no essential differences between the present material and the types.

200. ERIOPTERA (EMPEDA) BRUMALIS Alexander.

Erioptera (*Empeda*) *brumalis* ALEXANDER, Ann. Ent. Soc. America 40 (1947) 365–366.

IYO: Sugitate, January 27, 1952 (*Ishihara*).

201. ERIOPTERA (EMPEDA) NIGROAPICALIS Alexander. **Plate 5, fig. 46.**

Erioptera (*Empeda*) *nigroapicalis* ALEXANDER, Ann. Ent. Soc. America 13 (1920) 255–256.

The types were from Funkiko, Formosa, taken in April, 1917, by Shiraki.

IYO: Omogokei, altitude 800 meters, July 14, 1952 (*Ishihara*); a single female.

I can see no essential differences between this specimen and the types. In the present fly the blackend tips of the fore femora include approximately the outer third of the segment and are fully twice as extensive as are those of the posterior femora, those of the middle legs being still narrower. The venation is shown (Plate 5, fig. 46); I am unable to place Sc_2 with certainty but it appears to lie midway between the origin of Rs and tip of Sc_1.

202. ERIOPTERA (PSILOCONOPA) ASIATICA Alexander.

Erioptera (*Hoplolabis*) *asiatica* ALEXANDER, Ann. Ent. Soc. America 11 (1918) 447–448; Ent. Mag. (Kyoto) 3 (1919) 124–125.

Erioptera asiatica ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1527, *fig.*

The types were from the vicinity of Kyoto, taken between April and June, 1916, by Nohira. The species is widely distributed in Japan and into Eastern Siberia (Ussuri).

IYO: Matsuyama, April 14, 1952 (*Ishihara*).

203. ERIOPTERA (ERIOPTERA) HORII Alexander.

Erioptera (*Erioptera*) *horii* ALEXANDER, Philip. Jour. Sci. 24 (1924) 583–584, *pl. 2, fig. 22* (♂ hypopygium).

The types were from various stations in Karafuto and Hokkaido, later being found in Honshu and North Korea.

IYO: Joju, Mount Ishizuchi, altitude 1,400 meters, July 26, 1952 (*Ishihara*).

204. ORMOSIA (SCLEROPROCTA) CINCTIFER Alexander.

Ormosia cinctifer ALEXANDER, Ann. Ent. Soc. America 12 (1919) 336–337.

IYO: Iwazeki, near Matsuyama, March 9, 1949 (*Yano*).

205. ORMOSIA (ORMOSIA) LÆVISTYLA Alexander.

Ormosia lævistyla ALEXANDER, Philip. Jour. Sci. 50 (1933) 155–156, *pl. 1, fig. 21* (venation), *pl. 3, fig. 47* (♂ hypopygium).

The types were taken at Kibune, Honshu, in April, 1930, by Tokunaga.

IYO: Sugitate, March 21 to 30, 1952 (*Kusunoki*).

There is an unusual variation in the relative length of the male antennæ, in the extreme cases these being nearly one-half the length of the wing.

206. ORMOSIA NANTAISANA Alexander.

Ormosia nantaisana ALEXANDER, Ann. Ent. Soc. America 14 (1921) 117.

Described from Nantaisan, Honshu, the types being taken on August 16, 1909. Later it was taken at various alpine stations in Honshu.

IYO: Omogokei, altitude 700 meters, May 10 to 11, 1952 (*Ishihara*).

The material available includes only females but the identification appears to be correct.

207. ORMOSIA TOKIONIS Alexander.

Ormosia tokionis ALEXANDER, Ann. Ent. Soc. America 12 (1919) 336.
Ormosia tokionis ESAKI, et al., Icon. Insect. Japon. Ed. 2 (1950) 1527, *fig.*

The types were from the vicinity of Tokyo, taken in March, 1919, by Takahashi.

IYO: Dogo, Matsuyama, April 7, 1952 (*Yano*).

208. MOLOPHILUS (MOLOPHILUS) ISHIZUCHIANUS sp. nov. Plate 5, fig. 52.

Belongs to the *gracilis* group and subgroup; general coloration brownish black; antennæ (male) short; halteres and legs brownish black; male hypopygium with the basistyle conspicuously armed, especially the dorsal lobe which is unequally bifid, the inner arm again produced into two slender rods; outer dististyle longest near apex with a longitudinal row of about ten strong teeth.

Male.—Length, about 4.2 millimeters; wing, 4.8; antenna, about 1.

Rostrum and palpi black. Antennæ short, dark brown; flagellar segments oval, much shorter than the verticils. Head dark gray.

Thorax brownish black, the surface very sparsely pruinose; pretergites very narrowly yellow. Halteres brownish black. Legs with the coxæ dark brown; trochanters brownish yellow; remainder of legs dark brown to brownish black. Wings with a strong dusky suffusion, the prearcular and costal fields more yellowed; veins brown, macrotrichia darker. Venation: R_2 some distance beyond level of r-m; petiole of cell M_3 about twice m-cu;

vein 2nd A long, gently sinuous, ending about opposite midlength of the petiole of cell M_3.

Abdomen, including hypopygium, brownish black to black. Male hypopygium (Plate 5, fig. 52) generally as in *ferox,* differing in the details. Basistyle, *b,* with the ventral lobe stouter, provided with relatively few setæ; mesal lobe very low; dorsal lobe, *db,* conspicuously and unequally bilobed, the outer arm a glabrous sinuous blade; inner arm much shorter, at apex produced into two slender rods, the surface of the base with a few scattered scabrous points; in the type the inner arm is reflexed back over the base but this seems evidently to be an abnormal position and is shown outstretched in the drawing. Dististyles, *d,* shown separately so as not to obscure other structures; outer style the longest single element, exceeding the elongate dorsal arm of the basistyle, sinuous, gradually narrowed to the long apical spine, back from the tip with a longitudinal series of about ten strong teeth; basal dististyle much smaller, sinuous, narrowed to the acute tip, its surface with a few microscopic punctures. Phallosome obtuse at apex, the surface with exceedingly microscopic setulæ.

Habitat.—Japan (Shikoku).

Holotype, male, Joju, Mount Ishizuchi, altitude 1,400 meters, July 26, 1952 (*Ishihara*).

The most similar described species is *Molophilus* (*Molophilus*) *ferox* Alexander, of the Japanese Alps, Honshu, which differs especially in the structure of the male hypopygium. The so-called second dististyle discussed in the original description of the latter [Philip. Jour. Sci. **44** (1931) 365, pl. 2, fig. 45] refers to the inner arm of the dorsal lobe of the basistyle.

209. MOLOPHILUS (MOLOPHILUS) TRIFILATUS Alexander.

Molophilus trifilatus ALEXANDER, Trans. Amer. Ent. Soc. **46** (1920) 9–10.

The types were from the vicinity of Tokyo, collected in April and May, 1919, by Takahashi.

IYO: Matsuyama, May 2, 1952 (*Ishihara*).

Very similar to the type except that the apical lobe of the basistyle of the male hypopygium is somewhat shorter.

210. STYRINGOMYIA NIPPONENSIS Alexander.

Styringomyia nipponensis ALEXANDER, Philip. Jour. Sci. **40** (1929) 345–346, *pl. 3, fig. 14* (♂ hypopygium).

The type was from Asahara, Honshu, taken June 1, 1925, by Harukawa. Known also from Formosa.

IYO: Omogokei, July 14, 1952 (*Ishihara*).

ILLUSTRATIONS

[Legend: *a*, Ædeagus; *b*, basistyle; *bd*, basal dististyle; *c*, cercus; *d*, dististyle; *db*, dorsal lobe of basistyle; *g*, gonapophysis; *h*, hypovalva; *i*, interbase; *id.*, inner dististyle; *od*, outer dististyle; *p*, phallosome; *s*, sternite; *t*, tergite; *vd*, ventral dististyle].

PLATE 1

FIG. 1. *Macgregoromyia shikokuana* sp. nov.; venation.
2. *Tipula* (*Schummelia*) *ishizuchiana* sp. nov.; venation.
3. *Tipula* (*Schummelia*) *saragaminensis* sp. nov.; venation.
4. *Tipula* (*Oreomyza*) *ishiharana* Alexander; venation.
5. *Tipula* (*Oreomyza*) *ligulalata* sp. nov.; venation.
6. *Tipula* (*Oreomyza*) *melanonotalis* sp. nov.; venation.
7. *Tipula yanoana* Alexander; venation.
8. *Macgregoromyia shikokuana* sp. nov.; male hypopygium.
9. *Nephrotoma bifusca* Alexander; male hypopygium.
10. *Nephrotoma iyoensis* sp. nov.; male hypopygium.
11. *Nephrotoma minuticornis* Alexander; male hypopygium.

PLATE 2

FIG. 12. *Tipula* (*Schummelia*) *ecaudata* Alexander; male hypopygium.
13. *Tipula* (*Schummelia*) *saragaminensis* sp. nov.; male hypopygium.
14. *Nephrotoma iyoensis* sp. nov.; ovipositor, lateral aspect.
15. *Tipula* (*Oreomyza*) *imanoensis* sp. nov.; male hypopygium.
16. *Tipula* (*Oreomyza*) *ligulalata* sp. nov.; male hypopygium.
17. *Tipula* (*Oreomyza*) *ligulalata* sp. nov.; the same, in part.
18. *Tipula* (*Oreomyza*) *melanonotalis* sp. nov.; male hypopygium.
19. *Tipula yanoana* Alexander; male hypopygium.

PLATE 3

FIG. 20. *Limonia* (*Limonia*) *omogoensis* sp. nov., venation.
21. *Limonia tristina* Alexander; venation.
22. *Limnorimarga limonioides* (Alexander); venation.
23. *Antocha* (*Antocha*) *bidigitata* sp. nov.; venation.
24. *Dicranoptycha yamata* Alexander; venation.
25. *Limonia* (*Limonia*) *omogoensis* sp. nov.; male hypopygium.
26. *Limonia* (*Limonia*) *tanakai* (Alexander) male hypopygium.
27. *Limonia tristina* Alexander; male hypopygium.
28. *Limnorimarga limonioides* (Alexander); male hypopygium.
29. *Limonia* (*Geranomyia*) *gifuensis* (Alexander); male hypopygium.
30. *Limonia* (*Geranomyia*) *multipuncta* (Alexander); male hypopygium.

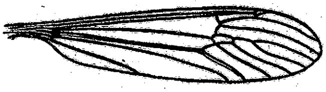
PLATE 4

FIG. 31. *Heterangæus gloriosus kusunokii* subsp. nov.; venation.
32. *Pedicia* (*Tricyphona*) *optabilis* (Alexander); venation.
33. *Dicranota* (*Rhaphidolabis*) *persessilis* sp. nov.; venation.
34. *Antocha* (*Proantocha*) *serricauda* Alexander; ovipositor, lateral aspect.

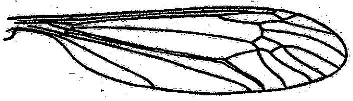
FIG. 35. *Antocha* (*Antocha*) *bidigitata* sp. nov.; male hypopygium.
36. *Antocha* (*Antocha*) *gracillima* Alexander; male hypopygium.
37. *Dicranota* (*Rhaphidolabis*) *consors* (Alexander); male hypopygium.
38. *Dactylolabis* (*Dactylolabis*) *diluta* Alexander; male hypopygium.
39. *Limnophila* (*Prionolabis*) *acutistyla* Alexander; male hypopygium.
40. *Limnophila* (*Prionolabis*) *uncinata* sp. nov.; male hypopygium.

PLATE 5

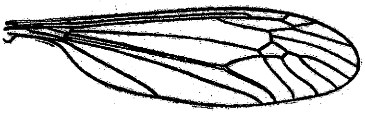
FIG. 41. *Limnophila* (*Prionolabis*) *uncinata* sp. nov.; venation.
42. *Limnophila* (*Adelphomyia*) *acicularis* sp. nov.; venation.
43. *Limnophila* (*Adelphomyia*) *biacus* sp. nov.; venation.
44. *Elephantomyia* (*Elephantomyia*) *subterminalis* sp. nov.; venation.
45. *Rhabdomastix* (*Sacandaga*) *japonica* Alexander; venation.
46. *Erioptera* (*Empeda*) *nigroapicalis* Alexander; venation.
47. *Limnophila* (*Adelphomyia*) *acicularis* sp. nov.; male hypopygium.
48. *Limnophila* (*Adelphomyia*) *biacus* sp. nov.; male hypopygium.
49. *Elephantomyia* (*Elephantomyia*) *dietziana* Alexander; male hypopygium.
50. *Elephantomyia* (*Elephantomyia*) *subterminalis* sp. nov.; male hypopygium.
51. *Elephantomyia* (*Elephantomyia*) *tetracantha* sp. nov.; male hypopygium.
52. *Molophilus* (*Molophilus*) *ishizuchianus* sp. nov.; male hypopygium.



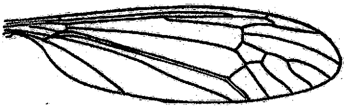
1



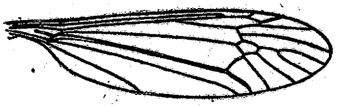
2



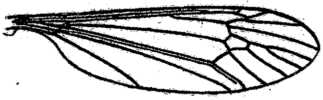
3



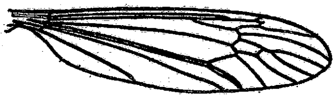
4



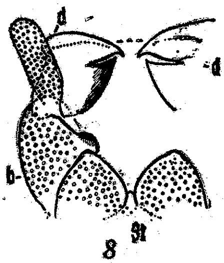
5



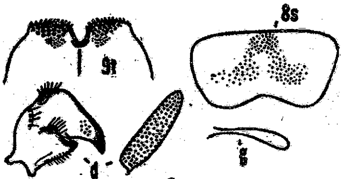
6



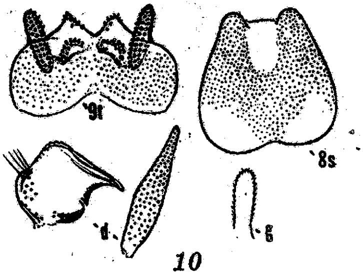
7



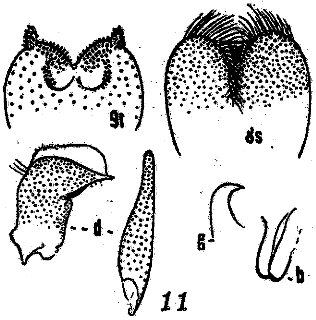
8



9

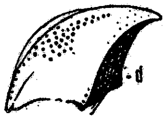


10

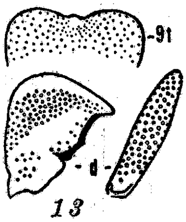


11

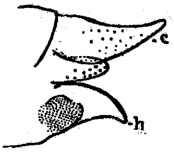
PLATE 1.



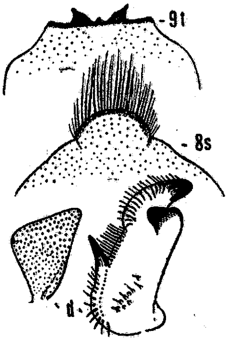
12



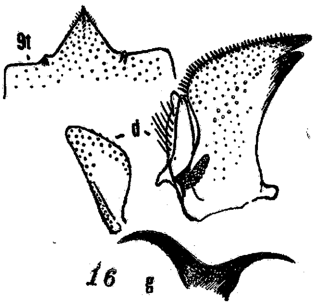
13



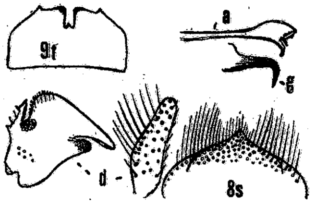
14



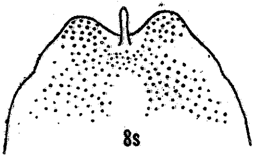
15



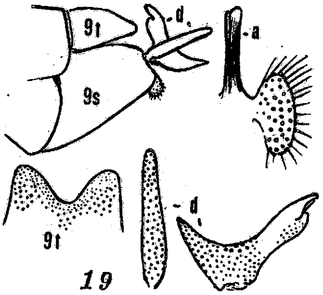
16



18

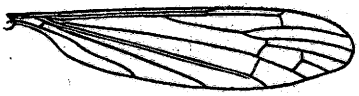


17

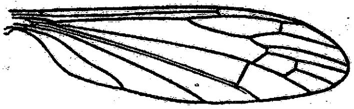


19

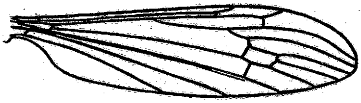
PLATE 2.



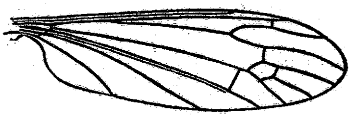
20



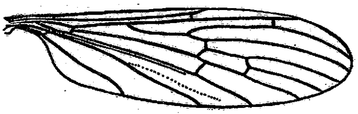
21



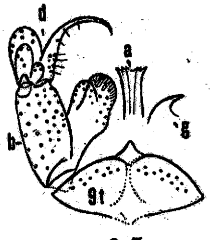
22



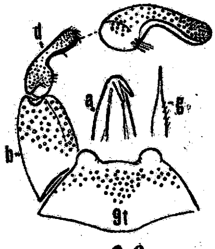
23



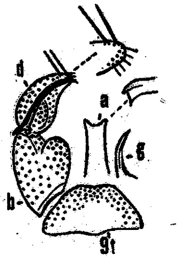
24



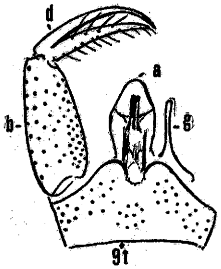
25



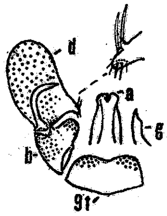
26



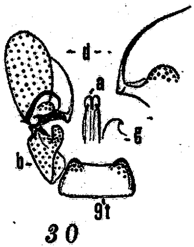
27



28



29



30

PLATE 3.

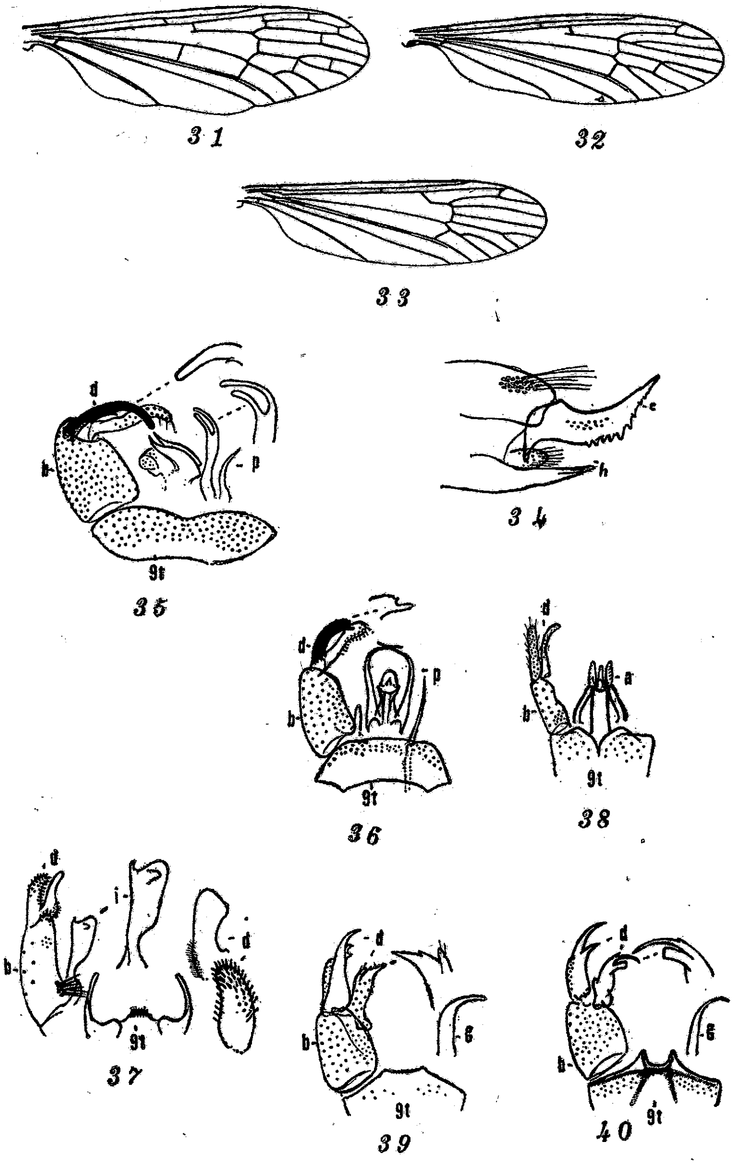
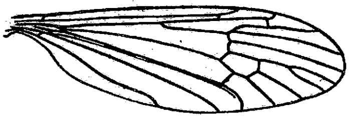
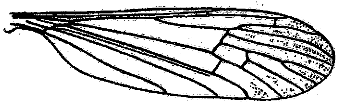

31
32
33
d
b
p
9t
35
e
h
34
d
p
b
9t
36
d
a
b
9t
38
d
i
b
d
9t
37
d
b
g
9t
39
d
g
b
9t
40

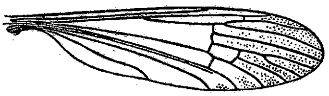
PLATE 4.



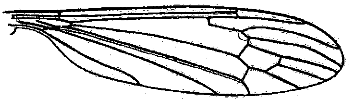
41



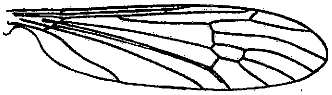
42



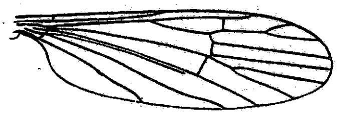
43



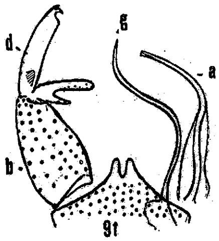
44



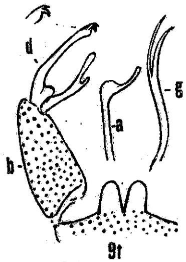
45



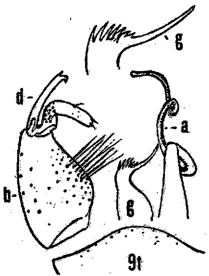
46



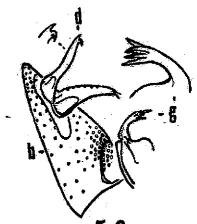
47



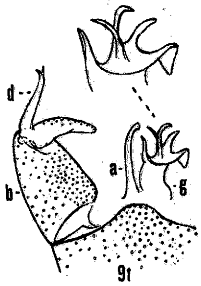
48



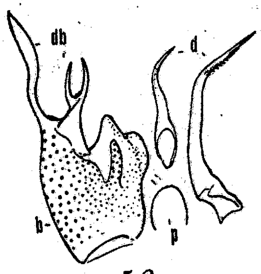
49



50



51



52

PLATE 5.